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Empire Mining and Metallurgical Congress, at Wembley

Photographs of the Principal Buildings at the Great London Exposition

By W. A. Doman

Pumping 2,200 ft. in a Single Lift

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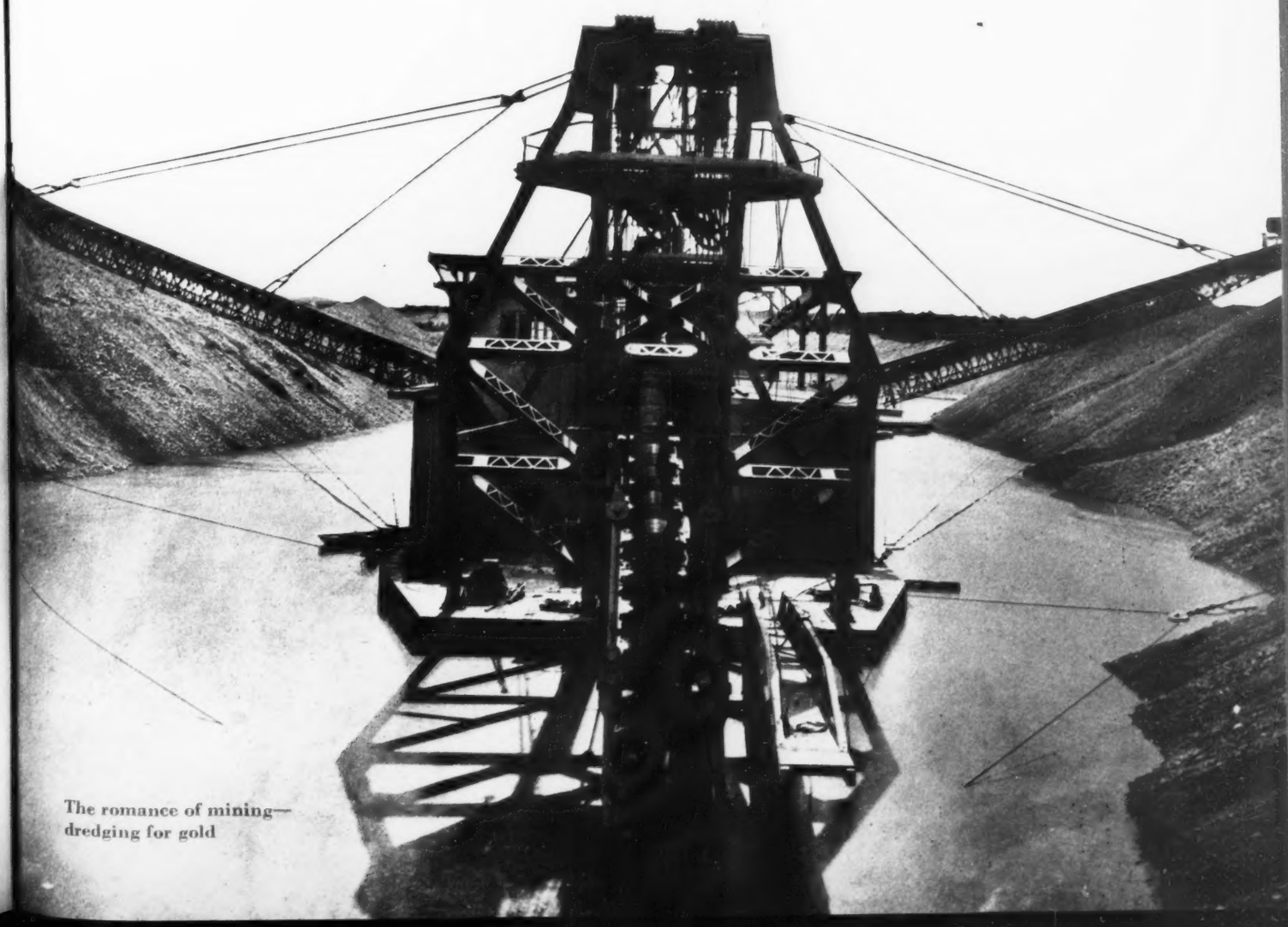
Marketing of Graphite

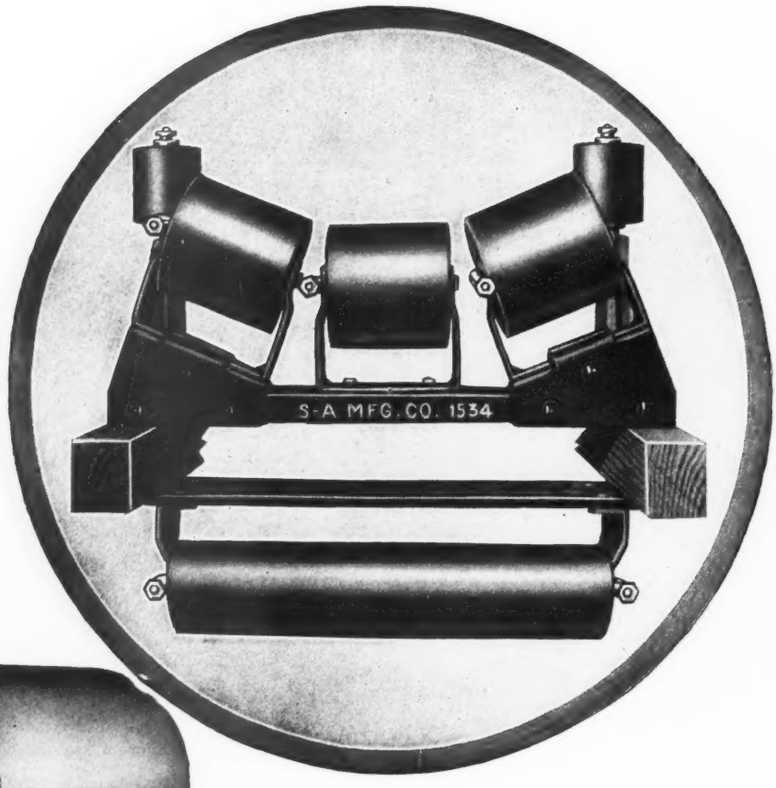
How an Important Non-metallic Mineral Is Bought and Sold

By Charles Pettinos

Gold Mining at Grass Valley, California



The romance of mining—dredging for gold



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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 117 New York, June 28, 1924 *Number* 26

Air Travel in the Bush

TRAVELING through the air has decided advantages in isolated regions where the topography is rugged and roads are few and circuitous in their windings. These advantages are most apparent, however, when the northern bush or tropic jungle can be avoided by the journey in a plane. As an engineer now in northwestern Quebec put it recently, "flying through the air is better than fighting flies, mud, and water on the damn river." For him it was forty-five minutes in the air versus three days on the water—better from every viewpoint of comfort, health, and efficiency—and as for safety the risk in the seventy-two-hour passage of the river was fully equal, in his opinion, to that of the short trip through the air, and the latter was more monotonous.

In the region of which he spoke, between Angliers, Quebec, and the new gold area of the Rouyn district, an airplane service has recently been established, and at least one company has found it of convenience when men and more supplies were needed in emergency. Even more advantageous will such service be in the tropics, where, though a sanitary camp may be established, the journey necessary to reach it may present various risks and inconveniences. The time saved, too, may be considerable. An executive of one important company with plants scattered in Peru has found it possible to make his regular visit of inspection in about four days, where formerly a month was necessary. Without doubt the future will see a wide extension of such service.

Organization

THERE EXIST TODAY a great number of societies, representing every conceivable aim, object, and interest. The tendency to coagulate breaks out in the high school, in the (generally officially forbidden) fraternities and sororities. In college, especially colleges that are small (and therefore also in those recently small, but now overgrown) the instinct is manifested in full force. Perhaps it is the manifestation of the tribal instinct, stronger, of course, in adolescence. Later in life this operates on more practical lines of organization. Every phase of one's activity is thus organized and developed by meetings, dinners, and proceedings far beyond the capacity of the individual to follow to the fullest. Once in so often he prunes down his list of societies because of the over-accumulation of society dues in his annual expense budget, and starts out with a narrowed list. This is a procedure seldom accomplished without subsequent regret, however. The warning never to resign from a club into which you have once entered applies equally to the society or organization.

For political and controversial questions, we have societies for and against most matters of importance. Technical and scientific societies are also numerous and well populated. They accomplish a great and useful purpose—they give a solidarity and an opportunity to meet and fraternize, and they provide a forum for the delivery and discussion of addresses and papers on technical and other matters pertaining to the scope of the organization. If a technical or scientific society is well directed, it becomes a great stimulant to the development of science. If, on the other hand, it is not managed in a wise and liberal way, it may well be a hindrance instead of a help to the advancement of knowledge. It provides, in its officers, or even in its membership, a scientific bureaucracy—a pseudo aristocracy of science—whose prevailing characteristics may sometimes be that they are scientific fundamentalists—that they stanchly look backward over the progress of science rather than forward. The French Academicians—the forty immortals—offer the most famous example of such a self-elevated group of littérateurs. Yet the strongest impression one has of this—whether fully justified or not—is of such and such a world-wide celebrated genius who is barred out of the Academy for many years on account of this and that.

The homely old proverb, "Handsome is as handsome does," applies to the association as much as to the individual. No organization, no list of officers and directors and committees, can help an organization which is otherwise lethargic.

Why Oil Remains Too Plentiful

IT TAKES MORE THAN PROPHECIES to stop an oil well flowing—and an Irishman might add "even those that have not yet begun to flow." Something seems wrong in the petroleum industry—if it is only the prophecies. Producers of the United States have been suffering acutely from overproduction, California being chiefly responsible. But though nature is making California mend her ways and the production curve there is dropping, no improvement in the general situation is to be discerned. There is still too much oil, evidently, though gasoline is yet sold by the gallon and not given away.

The cry is familiar—it used to be Mexico that was the culprit, then California. Who are the guilty ones now? "The Mid-Continent producers," says W. N. Davis, president of the Mid-Continent Oil & Gas Association, in a letter to members on June 9:

"There is no virtue in the oft-repeated observation that we do not have the large California pools confronting us this year that we had last year," says Mr. Davis in his letter. "The fact is that we have more production today than the country needs, and, with the stocks much heavier than they were at this time last year, it is not to be expected that the purchasing companies will purchase any considerable amount of crude oil for storage. This condition has been brought about by the intensive drilling campaign in the Mid-Continent field,

which furnished 1,570 completions in May as against 612 in January. If this condition continues, we may expect either refusal of new connections, with prorations in flush areas, general proration, or other forms of demoralization, with consequent waste unless producers immediately curtail output."

According to the report of the American Petroleum Institute, the daily average gross production of crude oil in the United States was 1,983,800 bbl. for the week ended June 7 and 1,983,400 bbl. for the week before, against 2,076,250 bbl. for the week ended June 9 a year ago. California's daily average for the week ended June 7 was 625,650 bbl., against 631,250 bbl. the week before, a decrease of 5,600 bbl., compared with 740,000 bbl. for the week of June 9 last year. It is evident that the hoped-for improvement in the situation still tarries.

Mr. Davis makes a pathetic appeal to producers to refrain from drilling an unnecessary well and to cease operations at once. He asks refiners to restrict their runs until gasoline stocks have been materially reduced. Lastly, he suggests the refusal of pipe-line connections to those who persist in drilling new wells. There was much similar talk last year, but very little curtailment resulted in the Mid-Continent field. All of which demonstrates the difficulty of getting concerted action on a matter of vital importance when there are a large number of producers and temporary profits are at stake.

To the Ladies

IF, FAIR READER, the Great Stage Director has cast upon you to play the part of wife to a young mining engineer, it is more than likely that some fine day fate will confront you with the problem of saying yes or no to an offer for your man to take a job in a small isolated mining community in a foreign country. Against this eventuality you ought to read "In and Under Mexico," a true and vivid account of a year spent by the author, Ralph McA. Ingersoll, youthful Yale graduate, at the Pilares copper mine of the Moctezuma Copper Co., in Mexico. The book is well worth reading for several reasons. It is good literature. But to you we commend it particularly because three or four chapters portray clearly and accurately the bitter tribulations, various but mostly social, of most of the twenty-five or thirty wives whose husbands form the American staff of superintendents, foremen, engineers, and office men at the mine.

When you have finished you probably will turn up your nose and think "an inferior lot of women indeed." But we venture to assure you that they were all educated average Americans who in Boston, in the Bronx, in Butte, or in Gopher Prairie would be as nearly contented as most of us are. The fact is that only about one woman out of a thousand is temperamentally suited to live under these conditions; and, if the figures furnished by the chief statistician of our social research department are accurate, at least three out of four who actually make the attempt are among the 999.

The average woman cannot live contentedly in a house from which she can get a good view of the front door of every other white woman living within two days' traveling distance. If there are only three or four families there is scarcely room for social friction; or if there are half a hundred or more, things seem to go smoother, possibly because it is impossible to keep track of the movements of all of one's neighbors. If more than one company is operating in a camp, the curse seems to be mitigated, but somehow about three-fourths of the wives in a medium-sized one-mine community seem to have a terrible time of it. We happen to know of one place where Mrs. Manager and Mrs. Assistant Manager, both estimable persons, were not on speaking terms, and each had a sort of following that kept everybody in hot water.

It is a matter of nerves. It is seeing the same people every day. It is being cooped up where you cannot get away. It is gossiping about the few people with whom you come in contact. Petty things grow big from continued cogitation. The men are occupied with their work; the women, who in foreign countries almost invariably are supplied with several servants, have too much time on their hands. They begin to feel sorry for themselves; spite, envy, petty jealousy, find lodgment. One can shake them off in other surroundings. If you do not know that the manager's wife spent two hours in Mrs. A's house after a brief call at yours no harm is done; but if you cannot avoid seeing her go in the house and come out, you do know, and you pay for the knowledge with bitter thoughts—unless you are that one in the thousand who is cut out for such a life.

You cannot understand. Nobody can until she tries it. How can you tell if you are one of the few? Probably you can't. But after reading "In and Under Mexico" you will be better able to reach a decision that you are. We should say that the first requisite for the woman who can make a success of living under such conditions is to be able to laugh at herself. It is the solemn seriousness with which trifles are considered that makes them deadly. She should be able to detach a portion of herself, go up in a mental airplane, and look down on the camp and realize that if the earth should open up and engulf the whole community, plant, people, and all, the rest of the world would go on just the same.

To you ladies who are now living in isolated mining communities we commend the book; its good-natured satire ought to help you when you find yourself overwhelmed with a mental blackness that comes from virtually nothing at all. And to you ladies who may be tempted to embark on an enterprise of this kind, we say that the portrait is true to life. If you cannot pick out and keep your mind on a thin streak of fun in much more that is terribly drab, stay away. You will only make trouble for yourself, for your husband, for the harassed manager of the mine, and, indeed, for the stockholders of the company. Put your foot down gently but firmly and tell hubby that you will stay in God's country, wherever that may be, unless and until he gets an offer as general manager at $25,000 a year, which is a horse of another color.

The Businesslike Institute

A WESTERN MAN who is on the list of "prospects" for membership at the headquarters of the American Institute of Mining and Metallurgical Engineers submits this sample of a circular follow-up letter recently received:

"Dear Sir:

"Referring again to our correspondence regarding membership in the Institute, we hope you are interested.

"We want to have associated with us all of the worthy men of the profession who are eligible for membership. We have a graded membership—for those actively practicing engineering; for those who are not strictly engineers but

are interested one way or another in the profession; and for students of engineering. Admission requirements are rigid and membership itself is a distinction.

"We have published an illustrated booklet about the Aims and Activities of the Institute, a copy of which we are eager for you to have. It costs too much to be distributed wastefully, however, and unless you are interested, we will not burden you with it.

"If you desire to have this booklet, which contains much about our rapidly expanding interests and activities, you can secure it by mailing the inclosed postal card. The proper notation by you on the postal card will also remove your name from our mailing list if you desire.

"Very truly yours,
"L. H. HIGGINS,
Membership Department."

The recipient observes that as a former member of the Institute he is sure that present members, who do not receive this literature, will be interested in this evidence of up-to-date go-getter business methods on the part of the Institute. The second paragraph, however, he believes could well be amended in the interest of truth and accuracy. In this paragraph the term membership is spread over all the Institute groups, which are, accurately speaking, members, associates and junior associates. When the writer states of all these groups that "Admission requirements are strict, and membership itself is a distinction," the desire to be persuasive leads to an evident exaggeration. We may grant that full membership in the Institute is a distinction, although even here the term would have to be defined (for is the term strictly applicable where a great list of "prospects" are bombarded with a series of circular letters?): but in the case of associates and junior associates the statement surely has no application, considering in the case of the latter, for example, that first-year men in engineering schools are welcome in bulk.

A Distinguished Provincial in New York

VISITORS TO NEW YORK CITY—and thousands of mining men come here every year—may perhaps profit from the relation of the experience of a well-known mining engineer who recently made his first brief tour of the States. Alone, and, as our friends from the Isle say, "dyin' for fun," he left his hotel one evening just before returning to England and sauntered down Broadway in search of adventure. The bright lights and the alluring strains issuing from a huge dance palace attracted him irresistibly. He knows how to dance. From East of Suez to London he has danced. Why not?

He entered, checked his hat and coat, and walked to the dancing floor, a bit uncertain as to the conventional mode of procedure. He was at once approached by the "hostess," a lady of most engaging personality and readily perceptible pulchritude (known in the "Roaring Forties" as a Perfect Pippin), who inquired if he wished to dance. Our engineer frankly said that that was the one thing in the world that he most desired to do. So from 8:30 to 11:30 he trotted, waltzed, and tangoed with the "hostess." Then a realization that he had monopolized somewhat more of her time than etiquette and the proprieties permitted, and such short acquaintance warranted, came over him. He thanked his partner effusively for a most charming evening, and insisted that he really must go.

"I've enjoyed meeting and dancing with you, too," said she. "But, you know, dancing is my business. You owe me twenty-three dollars and fifty cents."

Sure enough! Right at the entrance and in other places as well were conspicuous cards setting forth, so that all who danced might read, the rates of charge per dance.

"And do you know," said the visitor, in relating the story, "they wouldn't let me out till I paid it! I find that living is very high in New York. Double that in London and three times as high as in Edinburgh."

Conventions and Circuses

A SUCCESSFUL CONVENTION of coal mining men and manufacturers was held this spring at Cincinnati, when the American Mining Congress staged its annual meeting, this time for its coal mining division only. For several years past these annual meetings have gradually come to hold less and less of interest for metal mining executives and engineers. Attendance at Chicago, Cleveland, and Milwaukee was largely by those interested in the near-by coal fields, so that coal men dominated the conferences and the informal discussion of problems was conducted mostly from their viewpoint. Naturally the others lost interest.

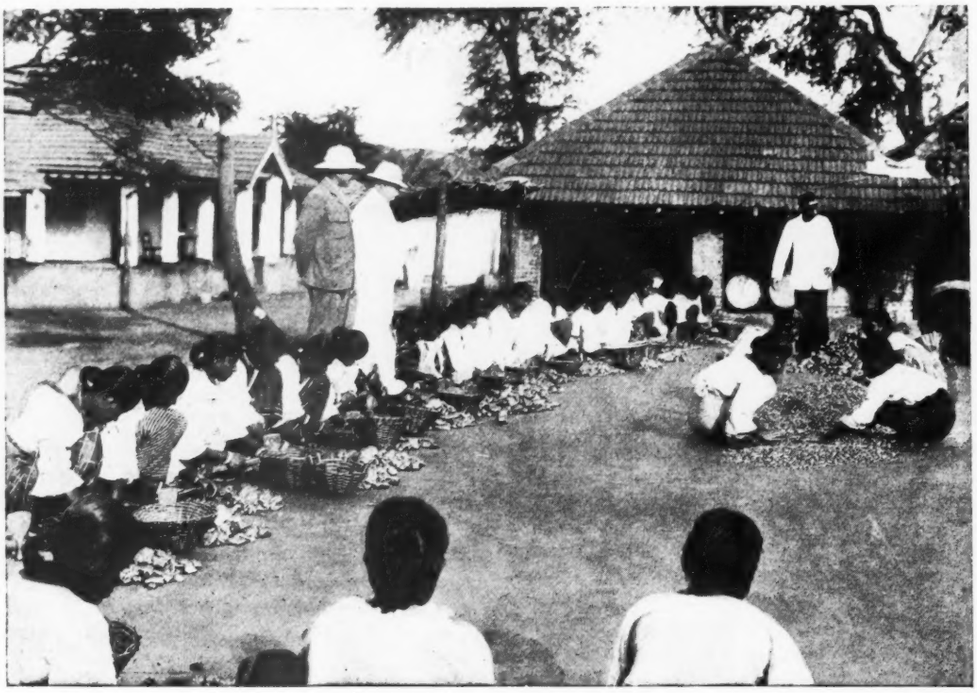
To remedy this situation separate conventions for coal and metal men were decided on for this year, Cincinnati for the former—this one held in April—and Sacramento for the latter, slated for October. The convention held at Cincinnati was remarkable for its attendance and its practical, interesting program. Time and place were well chosen—the dull season, when operators and their men were able to get away, and a meeting place only a night's ride or less distant.

A better choice than Sacramento for the metal mining men this fall could easily have been made. Denver would have been far better, everything considered. One is inclined to ask whether there is any good reason why a convention must jump from town to town each year as if it were a traveling circus? Some conventions may be circuses, but that of the Mining Congress is generally far too sober and sedate. That at Denver held four years ago, under the régime of Bulkeley Wells, was the livest one that we recall. Why not select the most suitable place for these meetings and convene there every year? Say Denver for the metal miners and Cincinnati for the coal men. Then the interest would be centered in the program and not in sight-seeing en route; and if the program were mostly bunk and nonsense, the convention would quickly die a deserved death.

R. S. V. P.

WE APOLOGIZE largely to our British cousins whom we have criticized for cometary tails of letter designs. We have chanced upon the card of one of the delegates from the United States to the World Power Conference in London—from East Rochester, N. Y. The delegate is, to quote her card, "Kate Gleason, A.S.M.E., A.C.I., V.D.I., R.E.S." If that doesn't knock 'em in London, we resign. The letters were formidable but unintelligible to our staff, but a skilled interpreter furnished a translation: American Society of Mechanical Engineers, American Concrete Institute, Verein Deutscher Ingenieure, Rochester Engineering Society.

All bets are off.



Sorting graphite at Colombo, Ceylon

Marketing of Graphite

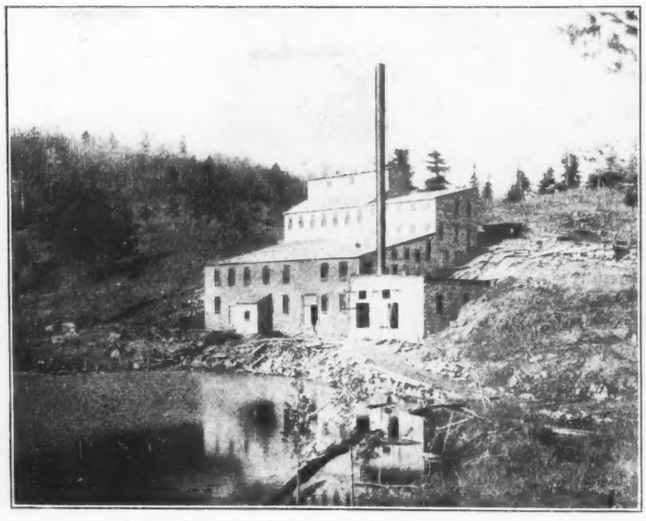
Principal Sources Are Ceylon and Madagascar—Domestic Supplies Negligible

By Charles Pettinos
25 Church St., New York

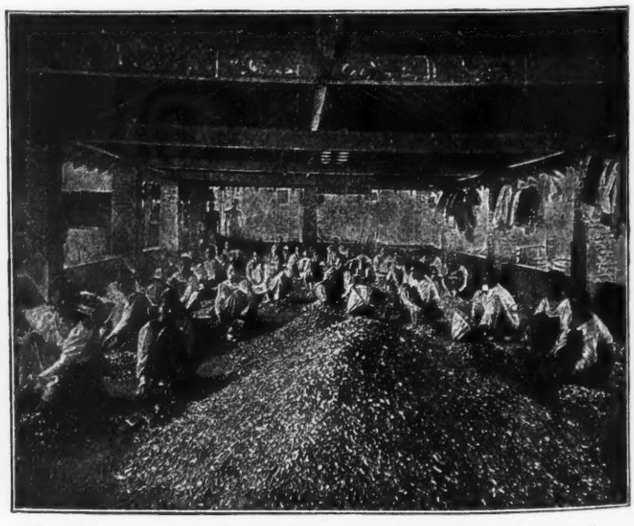
GRAPHITE, also called plumbago, silver lead, and black lead, is a graphitic form of carbon. Deposits of graphite are found in all parts of the world, but its principal occurrences are in the islands of Ceylon (British) and Madagascar (French), Canada, United States, Mexico, and Korea.

Mexican and Korean graphites are amorphous, or non-structural. The others are all crystalline, of a flaky or stringy (needle) formation. Crystalline graphite, as a rule, is more valuable than amorphous. It is used principally in the manufacture of crucibles, lubricants, and foundry facings. Amorphous graphite is used for lead pencils, lubricants, foundry facings, stove polish, and in other applications.

Crystalline graphite is found in two distinct formations: One, occurring in fissure veins (only in Ceylon to any extent), is massive with planes or surfaces that are not entirely parallel, or at times fibrous and stringy (called needle lump). The other, commonly called flake graphite (although both grades are flaky), occurs in a



One of several domestic graphite mills



Hand treatment of Ceylon graphite before shipment

disseminated ore, the flakes being scattered through the mass of gangue in varying proportions from 2½ to 10 per cent in American deposits to as high as 40 per cent in those of Madagascar.

The great bulk of crystalline graphite is used in the manufacture of crucibles, the Ceylon product being principally employed for this purpose. Madagascar and American crystalline graphites, which are of the flake variety, go into crucibles to a certain extent, and are also used largely for lubrication.

As Ceylon graphite (also called plumbago) occurs in fissure veins, it is possible for the mineral to be prepared for the market in an almost pure state merely by sorting it by hand from the ore and without the necessity of its being put through any mechanical concentration process. Any other crystalline or flake graphite requires a complete mechanical concentration before it is fit for the consumer. Amorphous graphite, such as Mexican or Korean, can also be produced in a very pure state without mechanical processing, and is prepared for the market merely by hand sorting and screening. It might be said, therefore, that Ceylon graphite in its raw state is used by the crucible manufacturer, and amorphous graphite in its raw state is used by the foundry-facing and stove-polish manufacturers. Lead-pencil graphite requires special preparation before it is ready for the pencil maker.

The chief marketing points for Ceylon and Madagascar graphites are in the two islands themselves; also such European ports as Marseilles, London, and Hamburg, and, in the United States, New York. Mexican and Korean graphites are usually bought at or near their points of production and shipped direct to dealers and manufacturers in different parts of the world. There are no well-defined seasonal requirements, the demand being more or less constant throughout the year, varying with business conditions.

In 1920 and 1921 the graphite business was very flat, with production almost at a standstill, especially in Ceylon and Madagascar. There were also large stocks ready for the market left over from the war, and these are being absorbed very slowly. This has caused a tremendous drop in prices, especially in the crystalline variety.

Specifications for Crystalline Graphite

Different specifications are applied to the several grades represented by the two crystalline forms of flake and Ceylon graphite, and also to the amorphous graphites.

Flake Graphite. — Specifications cover purity (graphite carbon content), size of flake, and physical appearance, as to color and brilliancy. A first-quality large flake (No. 1) calls for a graphitic carbon content of about 90 per cent. The flakes can be of assorted size, but the smallest should be large enough to remain on a 90-mesh screen, and none should be larger than 16 mesh. A first-quality small flake (No. 2) should test approximately 90 per cent graphitic carbon. It will permit of being passed through a 60-mesh screen, but should all remain on a 120 to 140 mesh. In other words, the very fine powder should be removed. They should both be silvery in color and brilliant in luster.

Ceylon Graphite.—Specifications here are quite exact as to purity, *character of formation*, and size. The material when mined is first subjected to a preliminary hand sorting and is then called "uncured stock." In this condition it contains pieces of all sizes, from large lumps several inches in diameter down to particles the size of wheat grains. It is then "cured" (hand work) by native female labor. This consists in breaking down the large lumps to remove hidden impurities, such as small veins of silica, and pockets of other impurities; then washing, sorting, and grading. It is screened into four sizes as follows:

Lump, consisting of pieces from the size of a walnut down to a grain of wheat.

Chip, about the size of wheat grains, or slightly smaller.

Dust, about the size of gunpowder grains.

Flying Dust. This represents the fines (almost a powder) bolted from the dust.

Lump as a rule is the purest and most valuable, chip in the order indicated next. Ceylon graphite, however, although all crystalline, occurs in several distinct formations, which are of prime importance in the determination of values. For example, two lots of lump may be of the same purity but of different formations and thus have widely different market values. The best quality is represented by pieces that are bright and clean with either a flat micaceous-like structure or the fibrous, stringy variety. The lower grades are duller and more earthy in appearance, with not so well-defined a crystalline formation. Although this latter formation may be just as pure as the former, it is not as valuable to the crucible manufacturer.

Amorphous Graphite.—This being non-structural, its physical appearance is of a more or less secondary consideration, except that it must be good silvery black color, unctuous, and with high slip. Specifications for a first-quality amorphous graphite call for at least 80 per cent graphitic carbon together with the above-mentioned physical properties. Lower grades are more harsh and coal-like in appearance and to the feel, and lower in carbon. There is no sizing or refining done to amorphous graphite, except that it is usually broken down by hand small enough to pass through about a one-half inch mesh screen so as to remove stones or especially hard undesirable pieces of graphite.

The chief impurities in both crystalline and amorphous graphite are silica, iron, and mica.

The high fire test of graphite, its inertness, high electric conductivity, and resistance to attack by chemical agents render it particularly useful in a number of industries. Its principal uses, with approximate proportion of total consumption, are as follows:

	Per Cent
Manufacture of crucibles	75
Manufacture of lubricants	10
Manufacture of pencils	7
Manufacture of foundry facing and stove polish	5
Manufacture of paints	3

As already stated, the chemical composition of graphite is carbon, and, based on the uses to which it is put, it is marketable down to a carbon content of about 40 per cent. It can be refined up to over 99 per cent. For general manufacturing purposes it should not contain more than about 1 per cent of moisture. The crucible manufacturer cannot use it in powdered form. When he receives a Ceylon lump or chip, he breaks it down with grinding machinery to particles or flakes of assorted size, and then passes it over a bolting cloth of about 90 mesh to remove the fine powder. This powder must be used for other purposes.

The same principle applies to lubricating purposes in connection with flake graphite; that is, it should not be in finely powdered form. Lubricating flake graphite varies in size and flake according to the class and size of the bearing on which it is designed to be used.

For all other purposes, such as pencils, foundry facings, stove polishes and paints, graphite must be finely powdered.

The quantities purchased in a wholesale way are usually in lots of twenty-five tons and upward. Individual manufacturers, such as crucible makers, will consume several thousand tons per year.

No customary premiums or penalties are allowed in connection with the wholesale graphite trade, except that the buyer expects delivery equal in quality to the selling sample and if the delivery does not meet such requirements, the parcel may be condemned and refused, or a compromise made between the parties interested. Official sampling is done by an outsider, who is experienced.

Foreign graphite shipped from abroad usually arrives through the port of New York. There it is weighed and sampled by public weighmasters. Ceylon graphite is packed in barrels carrying about 600 lb. Korean graphite is packed in smaller barrels of about 350 lb. each. Madagascar graphite is shipped in heavy, double, jute bags weighing about 200 lb. each. Mexican graphite is loaded loose in box cars. In the last named case, railroad weights govern settlement.

For domestic transportation, graphite sold in a wholesale way is shipped in car lots. A carload averages twenty to twenty-five tons. It carries a comparatively low rate of freight and is seldom insured or protected from loss in transit. Its value is computed on purity and physical appearance. Usual terms of settlement are followed.

The marketing of graphite has its own peculiar problems, in common with other commodities. The seller should know the product thoroughly, both chemically and physically, and has a decided advantage if he is familiar with its treatment in the factory and the results that can be obtained with the finished product in its various applications. He is thus enabled to stand back of his product and make guarantees as to its usefulness and results which cannot be made by one not thoroughly familiar with the article.

Market conditions and prices on graphite are controlled largely by the law of supply and demand. Granted unrestricted lines of transportation, it has always seemed possible for the producing department of the industry to meet the demand without difficulty, although naturally an increased demand tends to raise prices, at least until a large surplus is ready.

The greatest factor controlling the demand for and the price of crystalline graphite is the crucible maker, as he consumes by far the bulk of it. When he is busy, crystalline graphite mining is increased, and when he is inactive, many mines necessarily curtail their output or shut down entirely, only those that can operate most cheaply continuing production. Amorphous graphite is not so directly affected by any one trade or line of manufacture, although it is naturally affected by general business conditions.

During the last six or seven years there has been a great variation in the selling price of graphite, especially crystalline. A fair average pre-war price for the best Ceylon was 8c. to 10c. per lb. It reached a peak of 32c. per lb. during the war, and at present, even with the 20 per cent import duty which has recently been imposed upon it, the best of it brings only about 6c. per lb. and sometimes even less. At such a level there can be no profit in its production in a general way. The imported flake variety of crystalline graphite carries a duty of 1½c. per lb. and can be bought today at from 3½c. to 5c. per lb. ex-dock New York, including duty, according to purity and size. This also is below the cost of production, and when stocks on hand in Ceylon and Madagascar are exhausted, and fresh mining must be done, prices are bound to advance. Since the bulk of both crystalline and amorphous graphite is imported, it is natural that foreign graphite controls the price of the domestic article. The only considerable domestic production of graphite has been the flake variety of crystalline, and it must compete with Madagascar flake, the two being virtually identical. All the above-mentioned prices apply to graphite in the condition in which it reaches the manufacturer.

Actual production and consumption have varied to a great extent in the last six or eight years, owing to the war. Just prior to the war, in 1913 and 1914, production was a shade under normal. During parts of 1914 and 1915, embargoes and other delays restricted production and sale, but late in 1915 there was increased activity, continuing to a peak in 1917. It then shaded off to a production in 1921 under pre-war normal.

The following table gives columns showing an extremely variable world's production of crystalline and amorphous graphite covering the period 1916-1922. It should be explained that the U. S. production of amorphous graphite, per this table, is rather misleading, for the reason that the great bulk of this material consisted of a low-grade ore which, though containing some graphite, was suitable only for certain purposes.

World's Production of Natural Graphite, 1916-1922

In Metric Tons

	1916	1917	1918	1919	1920	1921	1922
United States (*a*)							
Amorphous	2,378	7,530	5,951	3,065	(*f*) 4,258	1,671	1,996
Crystalline	4,959	4,801	5,834	3,668	(*f*) 4,369	539	839
Canada (*a*)	3,588	3,369	2,826	1,199	(*f*) 1,987	(*f*) 361	590
Greenland	.....	.....	.....	(*b*)	1,380	2,000	(*d*)
Mexico (*c*)	4,836	6,869	5,080	4,023	2,992	(*e*) 2,911	2,054
Brazil (*c*)	1	15	45	2	.....	.....	.....
Austria	(*e*) 23,973	30,647	17,415	8,265	11,543	13,280	11,650
Czechoslovakia	26,313	22,073	27,355	31,234	(*b*) 22,925	(*b*) 20,000	(*e*) 22,000
Finland	.....	.....	.....	30	27	(*d*)	(*d*)
France	.....	1,650	2,132	650	272	(*d*)	(*d*)
Germany	30,649	37,458	40,966	30,525	(*e*) 20,639	(*b*) 24,565	30,000
Italy	8,182	12,117	11,653	7,626	5,398	(*e*) 5,233	7,300
Norway	.....	.....	.....	.....	10	.....	.....
Spain	1,240	1,980	710	1,958	6,315	2,772	(*d*)
Sweden	194	4	102	.....	7	.....	(*d*)
British India	1,525	105	82	129	102	25	(*d*)
Ceylon (*c*)	33,956	27,572	15,701	6,779	9,353	4,419	11,023
French Indo China (*c*)	.....	.....	.....	7,451	.....	.....	.....
Japan	1,149	1,331	1,886	(*e*) 1,954	(*b*) 1,135	(*b*) 950	1,000
Chosen (Korea) (*c*)	16,963	16,183	13,659	12,945	18,259	8,015	19,362
Madagascar	26,524	35,000	16,000	4,983	4,000	(*h*)	( )
Union of South Africa	55	78	72	78	(*b*) 66	(*b*) 44	38
Australia	72	89	208	102	54	(*d*)	(*d*)
Totals	186,557	208,871	167,677	126,666	115,091	86,785	107,852

(*a*) Shipment and sales. (*b*) Estimated. (*c*) Exports. (*d*) No data. (*e*) From unofficial source. (*f*) Preliminary figures. (*g*) Negligible.

Copper-Ore Leaching by Salt Water and Sulphur Dioxide

By C. S. Vadner

COPPER ORES are not especially soluble in a solution of salt, but a salt solution impregnated with sulphur-dioxide gas becomes a powerful solvent for the copper. The reactions might be represented as follows:

1. $xNaCl\text{-}aq. + SO_2 + H_2O = (xNaCl\text{-}aq.)H_2SO_3$
2. Dissolving various ores:
   - A. Green copper carbonate, or malachite.
     $CuCO_3\cdot Cu(OH)_2 + (xNaCl\text{-}aq.) + 2H_2SO_3 = 2CuSO_3(xNaCl\text{-}aq.) + CO_2 + 3H_2O$
   - B. Blue copper carbonate, or azurite.
     $2CuCO_3\cdot Cu(OH)_2 + (xNaCl\text{-}aq.) + 3H_2SO_3 = 3CuSO_3(xNaCl\text{-}aq.) + 4H_2O + 2CO_2$
   - C. Red oxide of copper, or cuprite.
     $Cu_2O + (xNaCl\text{-}aq.) + H_2SO_3 = Cu_2SO_3(xNaCl\text{-}aq.) + H_2O$
   - D. Silicate of copper, or chrysocolla.
     $CuSiO_3\cdot 2H_2O + (xNaCl\text{-}aq.) + H_2SO_3 = CuSO_3(xNaCl\text{-}aq.) + 3H_2O$
   - E. Ferrous carbonate, or spathic iron ore.
     $FeCO_3(xNaCl\text{-}aq.) + H_2SO_3 + H_2O = FeSO_3 + 3H_2O + (xNaCl\text{-}aq.) + CO_2$
   - F. Ferric oxide, or hematite.
     $Fe_2O_3(xNaCl\text{-}aq.) + 3H_2SO_3 = Fe_2(SO_3)_3(xNaCl\text{-}aq.) + 3H_2O$

The solution of copper ores by means of sulphurous gas and water is by no means new, but where this treatment was attempted on a large scale at one plant many years ago failure was recorded. Five reasons were assigned as causes for the trouble:

1. The attempt to saturate the water by simply blowing the gas through it.

2. The poor agitation obtained and the consequent length of time required to leach a comparatively small amount of ore.

3. The dilute solution obtained, 1 per cent being the maximum amount of copper which can be held in solution by an excess of sulphur dioxide.

4. The ease with which the copper separates from these solutions, both in the leaching tanks, pressure tanks, and filter tanks, forming the cupro-cupric precipitate throughout the mass of leached ore, which it was impossible to redissolve with sulphurous acid.

5. The difficulty of treating the remaining 40 per cent of the copper in solution as sulphate after the 60 per cent had been precipitated on scrap iron, which was not cheaply available. Among these reasons the following appears obvious: The solvent action of the solution is hastened by the use of heat, and, at a slightly elevated temperature, well below the boiling point of water, the resulting solution readily decomposes and precipitates the red cuproso-cupric sulphite ($Cu_2SO_3\cdot CuSO_3\cdot 2H_2O$) even in the mass of pulp. When this precipitate is once formed it is practically impossible to redissolve it by a solution of sulphur dioxide in water. The attempt seemingly would be one in which a chemical difficulty was sought to be overcome by mechanical means, resulting negatively. Again, the solvent action of such a solution on the gold and silver contained in the ores is not sufficiently complete.

After conducting numerous experiments with a view to overcoming what seemed to be the chief difficulty, it was found that the obstacle could be surmounted as follows: A common soluble chloride, such as salt, or a mixture of chlorides, was discovered to be a solvent for the red precipitate formed. When used in connection with sulphur dioxide gas and water, it prevented the formation of the precipitate. This has been covered by patent. At ordinary temperatures, no apparent action taking place between the soluble chloride and the copper solution, it appeared that the mere presence of the soluble chloride had the desired effect. Realizing that a useful application might be made of this discovery of a cheap and common solvent, acting also to prevent the precipitation of the red precipitate, numerous tests were made on various types of ores, for the purpose of determining the effectiveness of this combination, both on the copper and on the gold and silver contained. The results are given below:

C. S. Vadner

The material used in the preliminary tests analyzed as follows:

	Per Cent.
Copper	1.3
Lead	Trace
Silica	89.7
Iron	4.2
Zinc	0.1
Sulphur	0.2
Lime	0.7
Alumina	2.3
Magnesia	0.2
Gold, oz. per ton	0.016
Silver, oz. per ton	0.21

The material was ground to 4 mesh and treated with a salt sulphur dioxide solution for six hours.

	Analysis of Tailing	Extraction Per Cent.
Copper, per cent	0.35	66.00
Gold, oz.	0.015	6.25
Silver, oz.	0.1	52.38

On grinding the material to 20 mesh, the following result was obtained:

	Analysis of Tailing	Extraction Per Cent.
Copper, per cent	0.12	88.35
Gold, oz.	0.01	37.50
Silver, oz.	0.085	60.00

By grinding the material to pass 100 mesh, still better results were secured:

	Analysis of Tailing	Extraction Per Cent.
Copper, per cent	0.09	91.96
Gold, oz.	0.006	62.5
Silver, oz.	0.08	61.9

Comparative tests made with sulphuric acid gave no better results, even when special and more expensive chloridizing agents were used. The consumption of sulphuric acid on account of bases other than copper was 36 lb. per ton of ore. The results were thought to be so encouraging that an ore of the following composition from Arizona was selected for another test. The ore was ground to pass an 80-mesh screen and assayed as follows:

	Per Cent.
Copper	6.8
Lime	1.5
Iron and alumina	10.5
"Insoluble"	77.3
Gold	Trace
Silver	Trace

After treating with an excess of the solvent, the tailing assayed:

	Per Cent.
Copper	0.05
Lime	0.68
Iron and alumina	1.25

This is an extraction of 99.1 per cent of the copper.

The excess of sulphur dioxide gas was easily eliminated, and was available for re-use if desired; the solution was hydrolyzed, and then, on analysis, was found to contain:

	Per Cent.
Copper	1.00
Iron and alumina	0.07
Lime	0.16

The specific gravity was 1.11, and the solution was practically neutral. The analysis of the oxide of iron recovered gave 54.7 per cent metallic iron. The recovery of iron from ores and subsequently from the solution as above, also covered by patent, is based on the following simple and cheap reaction: When sulphur dioxide gas acts on an iron ore, in the presence of water, the reaction illustrated by equation E takes place and ferrous sulphite is produced, which in turn, by means of oxidizing agent, such as the compressed air that is used in eliminating the excess sulphur dioxide gas, is readily oxidized to blood-red ferric sulphite, thus:

G. $2FeSO_3 + SO_2 + O = Fe_2(SO_3)_2$

In applying compressed air to eliminate the excess acidity of the solution due to the presence of sulphur dioxide, a gentle heat is applied at the same time, so that dissociation of the ferric sulphite formed occurs practically simultaneously with its formation, thus:

H. $Fe_2(SO_3)_3 = Fe_2O_3 + 3SO_2$

The ferric oxide and sulphur dioxide can be recovered from the solution at almost any desired stage of the process. It is proposed to make sponge iron from the ferric oxide thus recovered, for use in precipitating the copper from solution. This reaction is hydrolysis of the third degree, being represented by the union of a weak base (ferric oxide) and a weak acid (sulphurous acid), which are easily dissociated by common agents such as water, compressed air, and heat.

Iron and Copper in Cuba

By Juan R. Casanovas

Approximately $20,000,000 in American capital has been spent in the acquisition of iron-ore properties—buying mining claims and rights, and conducting exploration and development—in the Island of Cuba. This indicates the importance of the immense iron resources of Cuba, which total, it has been estimated, 3,500,000,000 tons of chrome-nickel iron ore.

There is available 500,000,000 tons of ore, which could be obtained easily at reasonable cost. These properties are comparable with the best of the Mayari and Moa fields. The general characteristics and origin of the ore are the same, and equally good transportation is available.

The Importance of the Copper Mines

Cuba, likewise, has important and rich copper mines. The Matahambre mines, of Pinar del Rio, were opened in 1914. The property was brought to a producing basis within one year from the time development was begun, paying a profit in that short time. It has been ever since a remarkably rich mine.

The importance and possibilities of Cuba as a copper country cannot yet be fully determined or ascertained, as little exploration and investigation work has been done, especially in the vicinity of Baracoa, Oriente Province, where ore has been found that assayed 31 per cent copper, 5 oz. silver, and contained traces of gold. Bornite, covellite, chalcopyrite, cubanite, and native copper are the commercial ores found right at the outcrop, occurring as small lenses and pockets and as lenticular veins. These lenses are found in metamorphic rocks in broad zones.

The Rio Frio, Jauco, and Esperanza prospects, in the region of Baracoa, are interesting, and further investigations and exploration work should be worth while.

Underground at the Homestake Mine, South Dakota

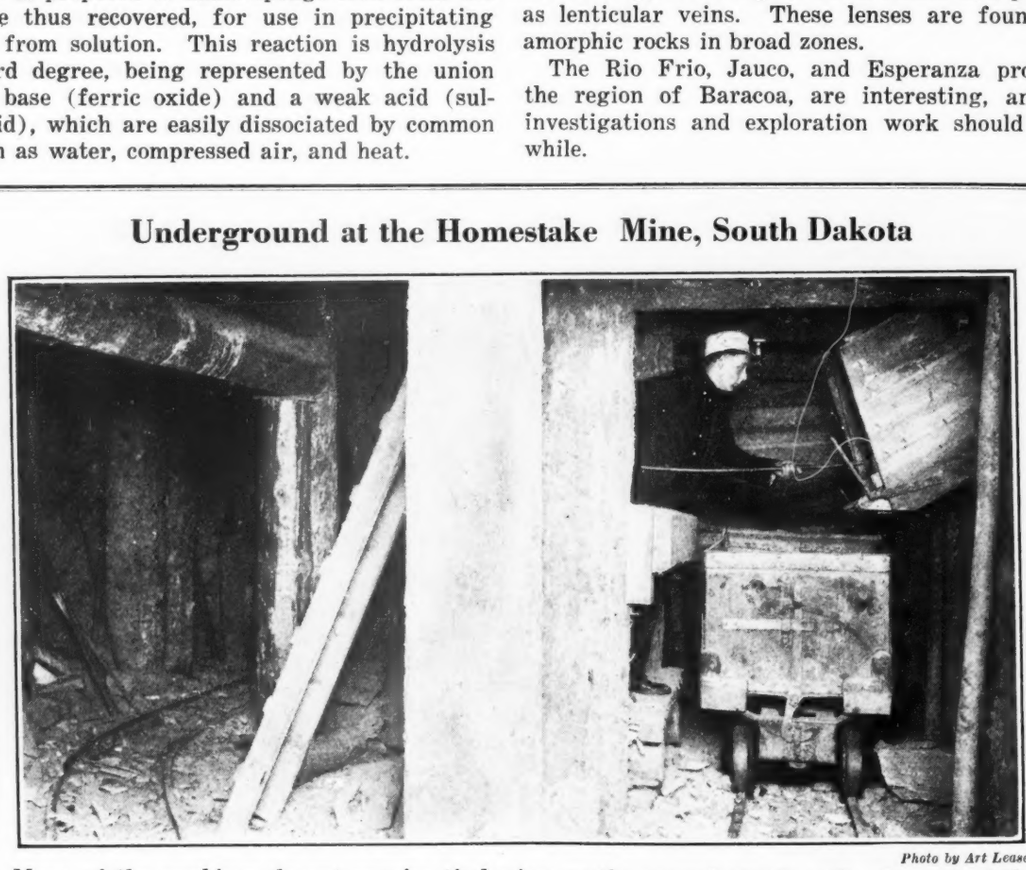
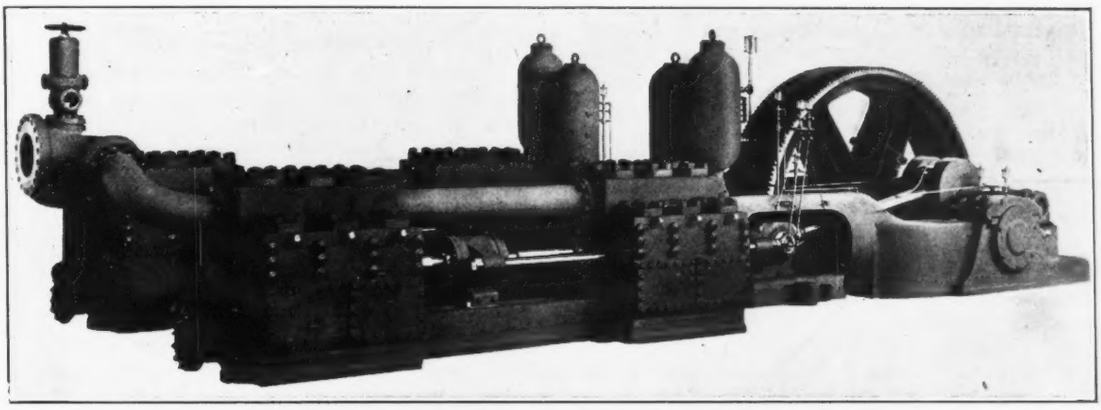


Photo by Art Lease

Many of the workings do not require timbering, as the ground stands well. In part of the mine the cars are hoisted to surface after loading; elsewhere skips are used



Electrically driven pump designed to work against 1,000-lb. pressure

The water cylinders of this pump are made of forged-steel billets, bored for valve seats, piston holes, and other openings.

Pumping 2,200 Feet in a Single Lift

Details of a Large and Unusual Installation Just Finished in the Junction Shaft of the C. & A. Mining Co. at Warren, Ariz.

By E. F. Irving
Master Mechanic, Calumet & Arizona Mining Co., Warren, Ariz.

THE Calumet & Arizona Mining Co. is completing the installation of a mine-drainage plant at its Junction mine, at Warren, Ariz. The pumping equipment is arranged compactly in a pumping station close to the main working shaft on the 2,200 level. The installation is unusual in that it combines large capacity and high head in a single lift to the surface. A simple, rugged, high-efficiency plant has been designed. Fireproof construction as well as minimum maintenance and operation along with the maximum obtainable operating efficiency have been the objectives of the designers.

All mine water will be brought to the 2,200 level through raises and crosscuts and pumped to the surface in one lift. The present steam-pump stations on the upper levels will be dismantled, thus placing the drainage equipment in one place and simplifying its operation. New features in the design of the pumps have resulted in reducing the floor area required to a minimum. All parts have been standardized, thereby reducing to a minimum the number of repair parts to be carried in stock.

The installation consists of three motor-driven pumps, two of 1,000 gal. per minute and one of 1,500 gal. per minute. A fourth pump, of 1,250 gal. per minute, will be added later. Each pump is of the horizontal, duplex, four-plunger type. The plungers are outside-packed. All are operated at 52 r.p.m. The 1,000-gal. pumps are equipped with 7.75-in. plungers, 24-in. stroke; the 1,500-gal. pump has plungers of the same diameter but 36-in. stroke. Each unit is driven by a synchronous motor through flexible couplings and single-reduction herringbone gears. The motor speeds are approximately 514 r.p.m.

The power is applied to each pump through a four-bearing crankshaft, each crank having a bearing 11 in. in diameter by 24 in. long on either side. Bearings are provided with wedge adjustments for maintaining alignment and to take up wear. The frames are extended to the front and carry the pinion-shaft bearings 8.5 in. in diameter by 24 in. in length. The front crossheads are connected to two side rods, Fig. 1, which in turn connect with the plunger crosshead. The plunger crossheads are large, hollow steel castings capped with heavy steel flanges to which the smaller flanges of the plungers are attached. By removing any one of the steel flanges, the corresponding plunger can be slipped back into the crosshead and removed from the plunger barrel without disturbing any other part of the pump.

The water ends are forged-steel billets bored for water passages, valve seats, and other openings. They are supported on heavy cast-iron bases which include the suction chambers and carry the guides for the plunger crossheads. A heavy cast-steel pipe, 8 in. in diameter, between the two quarters on each side, serves

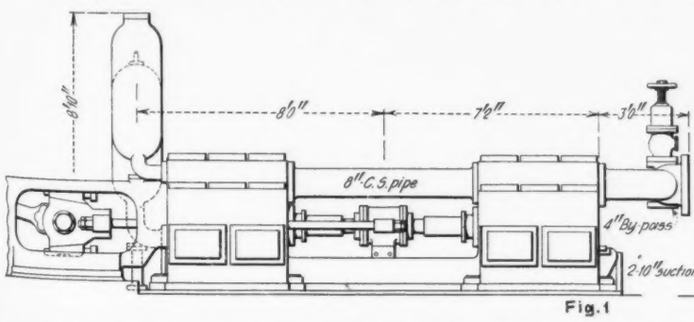


Fig. 1

Fig. 1—Water end of pumps, showing pipe connections

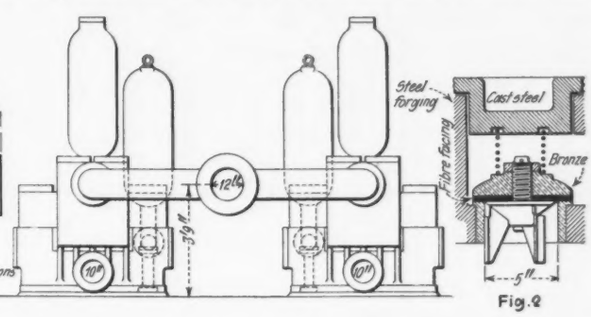


Fig. 2

Fig. 2—Detail of valve

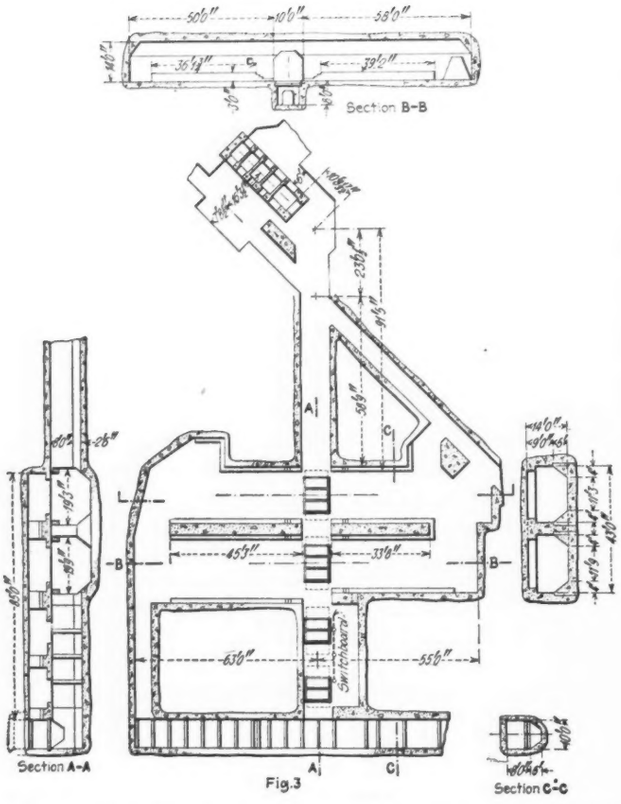


Fig. 3—Details of concrete work for the pump station on the 2,200 level

as a stay and also as a passageway for the water on its way to the discharge column.

Four air chambers are provided on each pump. The suctions are 10 in. in diameter and the discharge is 12 in. The valves are of the wing type and are fiber faced. (Fig. 2). The bore of the seats is 5 in. in diameter. Sixteen suction and sixteen discharge valves are provided on the 1,000-gal. pumps and twenty-four suction and twenty-four discharge valves on the 1,500-gal. pump. Fig. 1 indicates the arrangement of the valves. This design of the water end is especially advantageous, as it shortens the length of the pumps compared to older designs, and eliminates both suction and discharge manifolds. The width of the pump across the water end is less than the clearance dimensions across the power end.

The pumps are each supplied with gravity oil-feeding systems, complete with filters and with oil pumps operated from the crossheads. The gears are inclosed and run in oil. Each pump is provided with an air-charging device which utilizes the water-column pressure to charge the air chambers.

The fourth pumping unit has not been decided upon. If mining conditions permit, a motor-driven pump on the 1,800 level will be dismantled and installed in the pump station. This unit is a horizontal, duplex, pot-form, four-plunger pump, operated at 100 r.p.m. It was built for 1,450 gal. per minute against a 2,200-ft. head. It is driven by a 900-hp. synchronous motor mounted directly on the crankshaft. The plungers can be changed so as to give a capacity of 1,250 gal. per minute. It is the intention to make this change if the unit is moved to the new station.

The motors are all of the synchronous type, two 750 hp. and one 1,050 hp.; all 2,200 volt, 60 cycle, 3 phase, 514 r.p.m. Special impregnated windings are used to withstand underground moisture. Each motor has its own exciter, direct-connected. All exciters are of the same size and are interchangeable. The motor leads are taken out at the top of the motors, as all of the cables are carried on the roof of the station.

Power is taken from the main buses of the surface switchboard (2,300 volts) through three 500-amp. switches, and is then conducted down the shaft by three 250,000-circ.mil, three-conductor, stranded insulated submarine-type cables (4,000-volt insulation) to the underground switchboard, which is placed close to the main station drift (Fig. 3). These cables terminate in three oil-switch panels, each of which is in turn connected to a short busbar. Each busbar is connected to a 300-amp. feeder switch panel. From the 300-amp. switches a 0000 cable is carried to the motor starting panels, which are so placed as to give the operator a full view of the motors and pumps when starting.

The busbars of the underground switchboard are interconnected so as to admit of various combinations. The electrical switching arrangement permits repairs to be made (except on motor starting panels) without shutting down the pumps. It also gives the operator an opportunity for quickly cutting out any unit that breaks down. The surface panels include overload time-limit release, three ammeters, one P.F. meter, one integrating and one indicating wattmeter, instrument transformers, and disconnecting switches. The underground terminal panels are provided with overload time-limit release, one voltmeter and indicating lights. The feeder panels are equipped with overload time-limit release, no-voltage release, and one ammeter with three sockets for ammeter plug. The starting panels are provided only with the instruments necessary for starting.

Three sources of 2,300-volt current are available at the surface switchboard, one of which is from steam turbines in the surface plant. Local and incoming power circuits are amply protected by electrolytic lightning arresters. The cables in the shaft are supported by clamps spaced 20 ft. apart. One splice in each power cable was necessary in installing the cables. This was placed 1,500 ft. from the surface. An opening at this level gives ample room for splicing and for looping the cable so as to relieve the splice of any weight.

The general layout of the connecting pipes on the station is shown in Fig. 4. The pipes are 12.75 in. outside diameter and the walls are 1 in. thick. The specifications call for 24-in. diameter flanges 3½ in. in thickness, made of cast steel, the pipe to be screwed through the flanges and faced off flush. The finishing cut on the flanges is made at the same time so that all flanges are square with the pipe.

All valves and fittings are of cast steel and are designed for 1,200-lb. working pressure. Joints on the station piping are made with a plain-face flange against a female face with a 0.25-in. fiber ring gasket between. This arrangement enables any pipe or fitting to be removed without disturbing the position of the rest of the system. Expansion and vibration strains are allowed for by using 45-deg. turns into the shaft and extra lengths of pipe where the two horizontal pipes are interconnected. The pipes on the station are supported by I-beams at 20-ft. intervals.

The valve arrangement is such that either one or both columns can be used, or three pumps can discharge into one column and one pump into the other. This flexibility is necessary, as mine water is used in the boilers and advantage must be taken of any clear water.

The water columns in the shaft are 12.75 in. outside diameter. The thickness of the metal varies in accordance with depth from the surface. Fig. 4 shows the column arrangement below the 2,200-ft. station. These pipes have 1-in. walls and 24-in. diameter flanges. They are supported by a box section steel girder set in the concrete shaft walls (Fig. 5). Above the cast-steel sweeps where the columns leave the station the pipes are fitted with cast-steel flanges, 19 in. in diameter (twelve 1-in. bolts on a 17-in. diameter circle). The flanges are 3.5 in. thick just above the station and are made male and female, with high-grade rubber gaskets between. To facilitate placing of gaskets, the top flange on each pipe length is the female. The flanges are finished on the pipe similar to the procedure followed in the station piping.

The steel girder across the shaft supports the entire weight of the two columns to the surface, and alignment is maintained by loose clamps spaced 20 ft. apart. The clamps are bolted to 6-in. I-beams that extend across the shaft walls (Fig. 6). At 100-ft. intervals heavy 12-in. I-beams replace the 6-in. beams. These are used as bases for jacks and clamps if a section of column has to be replaced.

Station Contains Much Reinforced Concrete

The plan of the station is shown in Fig. 3. The heavy ground necessitated a great deal of concrete and reinforcement, to prevent movement. This condition influenced the selection of the size and shape of the pump stalls. The sump was designed to hold 3,500 gal. per minute (normal flow), with a rise of 5 ft. in thirty minutes. This allows sufficient storage to cover normal periods during which the power may be off. The foundations of the pumps are 3 ft. higher than the top of the sump. In case the power is off for more than thirty minutes, the mine drifts and station will store water for two hours before the level of the water rises sufficiently to enter the motor windings. This time interval is more than sufficient to permit of connecting to another source of power.

The main station drift, pump stalls, and sump are all heavily reinforced. The reinforcing supports anchor bolts and bolt pockets in the roofs and sides to support small pipes, cable hangers, and cranes for handling valve covers and other parts.

The station will be lighted by 110-volt lamps connected to the mine system. An auxiliary lighting system connected to a storage battery and carrying 32-volt lamps will cut in automatically whenever the lighting power circuit is off. Ventilation details have not been worked out, as no development work has been done on this level. Temporary ventilation will be provided by pipes and a blower placed near the shaft. As an added precaution, all main drifts will be provided with watertight steel doors close to the station, which can be shut in emergencies to prevent flooding the pump stations.

The Prescott Co. furnished the pumps; pump gears were made by the Falk Corporation; motors and switchboards were the product of the Westinghouse company; pipes and fittings were supplied by the Crane Co., and the power cables by the General Electric Co.

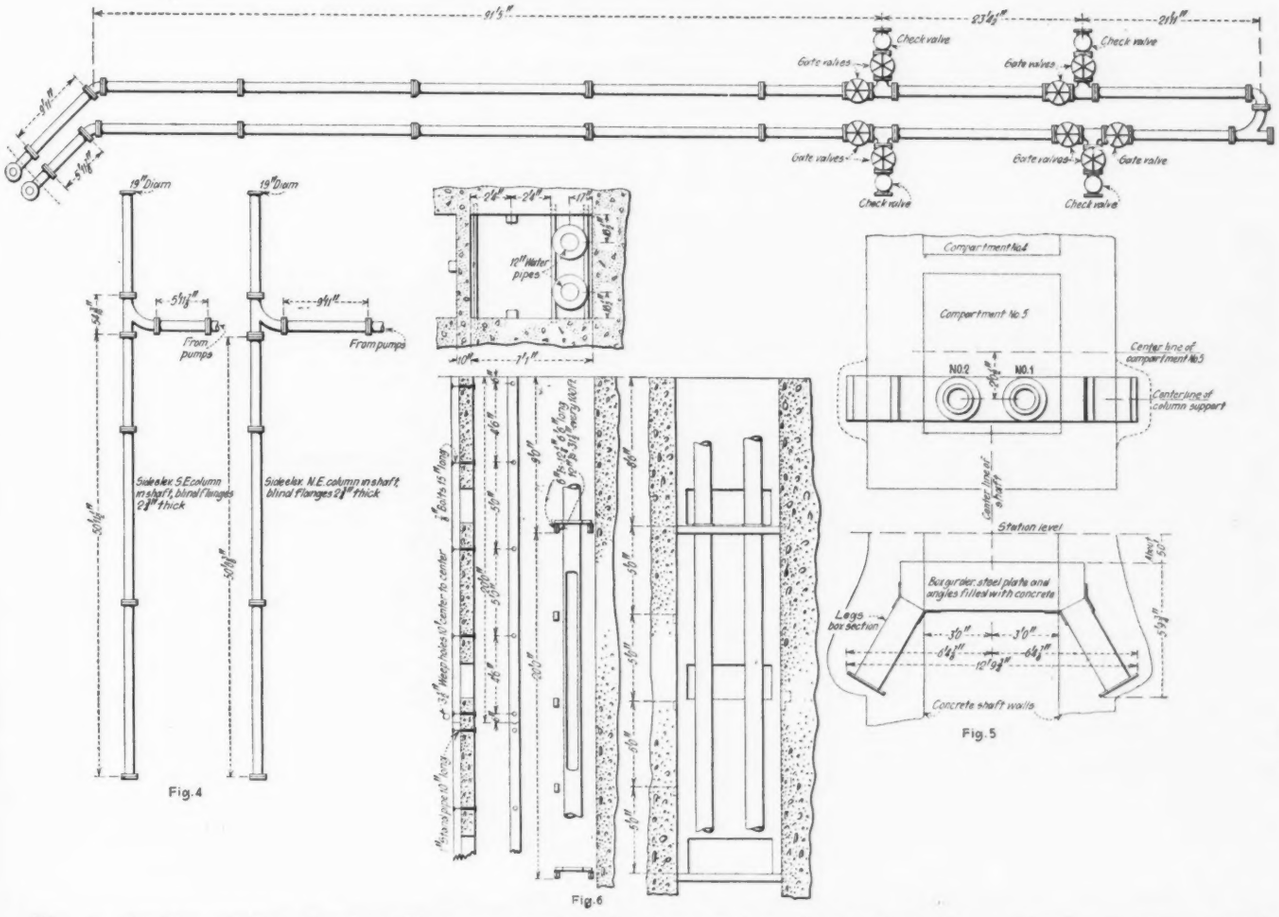


Fig. 4—Station piping, showing the arrangement of column below the 2,200 station. Fig. 5—Detail of steel column base. Fig. 6—Plan and section of compartment in the shaft

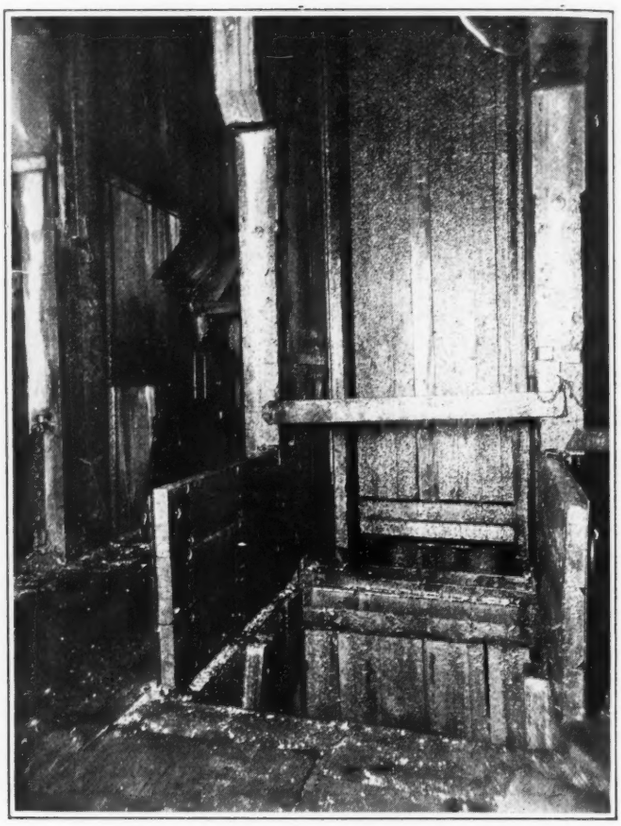
Homestake Method of Changing Skips

By Felix Edgar Wormser
Assistant Editor

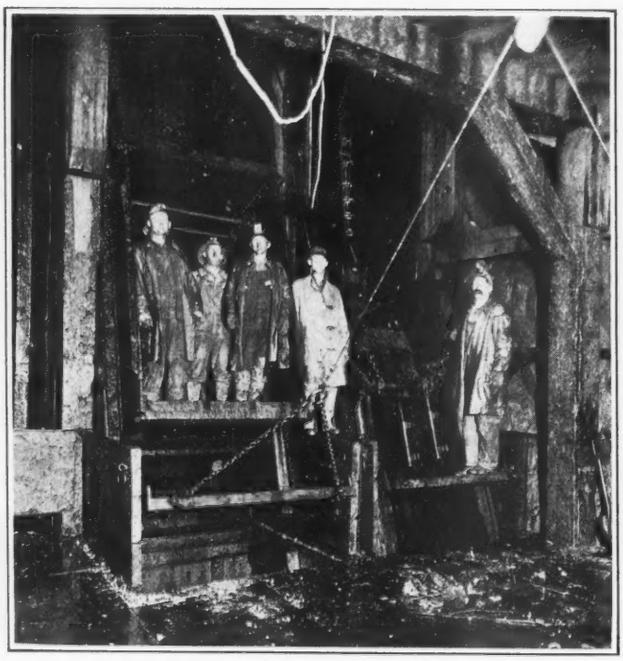
THE Homestake Mining Co., in Lead, S. D., employs a method of skip-changing in one of its mines which I do not think has a counterpart anywhere else in mining districts. The change is made at the bottom of the shaft, whereas the usual practice is to make the change on the surface. The procedure is simple and is shown in the accompanying photographs and sketch, which have been kindly supplied by the Homestake company.

At the bottom or 2,300 level of the Ellison, or main hoisting, shaft, the sump has been enlarged to make room for two cage pockets directly in front of the hoisting compartments. This has necessitated excavating a chamber three sets deep, about 12 ft. wide, and as broad as the shaft. Movable guides were provided as shown in the diagram, to swing forward so as to guide the cages into their respective chambers. Details of the plate and pin on which the guides pivot are given in the diagram, which also shows the small air-hoist used to pull the guides forward when the change is being made. The wooden guides are fastened to steel strips to reinforce them.

Photograph No. 1 is a view of the top of the cage pocket at the 2,300 level of the Ellison shaft with the cages ready to be lowered or hoisted. The main hoisting compartments are in the background. Careful inspection of the photograph will disclose the ¾-in. strip of iron to which the movable main guides are fastened and the eye-bolts to which the air-hoist chain is hooked. When a change is to be made the cage is lowered in the shaft while the movable guides are swung forward and held in position. The cage follows into its pocket and the rope is detached to be connected to the skip resting in the sump of the main compartment. Trap doors covering the cage pocket are closed immediately after the change. When the trap doors are closed they lock the guides in vertical position. Guides are not locked in forward position, but are held by the air-hoist brake.

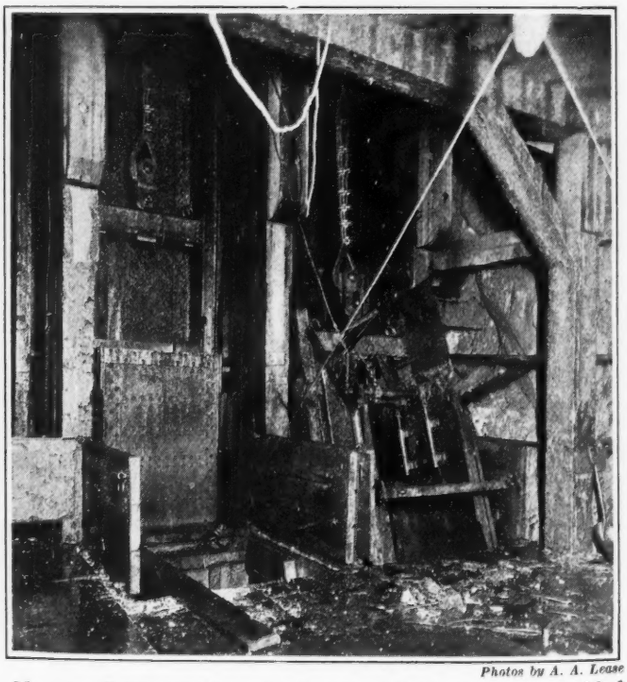


No. 3—Cage pocket open. Guides in main hoisting compartments are movable



No. 1—The 2,300 level of the Ellison shaft with cages ready to be moved

Main hoisting compartment in background. An air-hoist is used to shift movable guides forward.



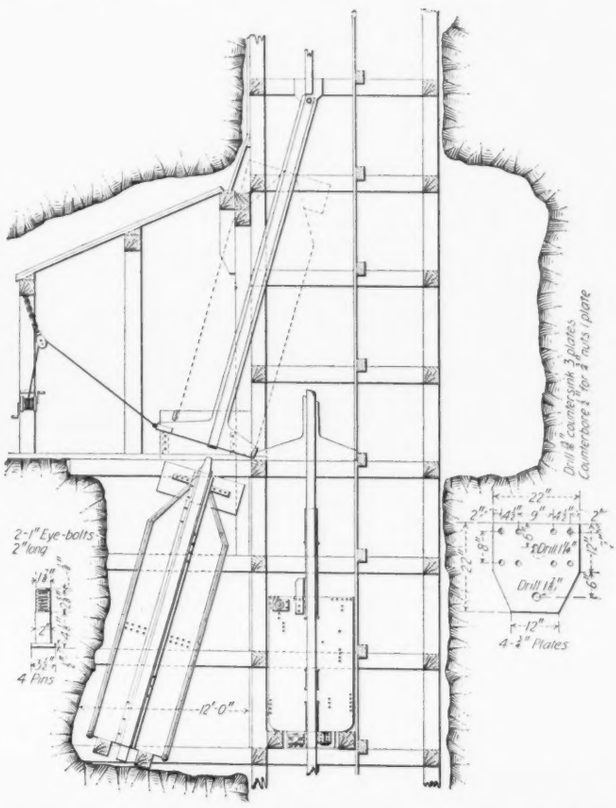
Photos by A. A. Lease

No. 2—Cage ready to be lowered into pocket provided for it

Skip is ready to be used after being hoisted from sump while other cage rests in its pocket.

Photograph No. 2 shows the cage being lowered into its pocket. One skip has been hoisted from the sump and is ready to be used.

Photograph No. 3 shows the collar of the cage pocket and the main hoisting compartments in the rear. The skips rest in the sump of the shaft and are invisible. When the cages have been lifted high enough to clear the hinge point of the movable guides four sets above



Sketch showing position of movable guides in shaft, and pocket built for cages. Details of pin and plate are indicated

the station floor, the guides are swung back into position and the trap doors locked.

The complete change takes approximately ten minutes, but could be made in less time if required. The system has worked very satisfactorily since its installation at the Homestake two years ago, when the surface plant was remodeled.

Alaska Juneau Unit Records

The records of unit production by the Alaska Juneau Gold Mining Co. for 1923 are based upon a production of 2,476,240 tons of ore. The more important units or ratios are as follows:

1. All men on mine payroll—man-hours 528,839; tons 2,476,240; 4.68 tons trammed per man-hour, or 0.213 man-hours per ton trammed.

2. Man-hours on development, 54,568; 45.38 tons trammed per development man-hour, or 0.02 man-hours per ton trammed.

3. Man-hours on preparatory mining, 21,176; 116.93 tons trammed per preparatory mining man-hour, or 0.008 man-hours per ton trammed.

4. Man-hours on stoping, 3,584; 690.91 tons trammed per stoping man-hour, or 0.0014 man-hours per ton trammed.

5. Man-hours bulldozing, 132,224; 18.73 tons trammed per bulldozing man-hour, or 0.053 man-hours per ton trammed.

6. Man-hours tramming, 109,552; 22.60 tons trammed per man-hour or 0.044 man-hours per ton trammed.

7. Man-hours for total organization, including mill and office, 1,161,212; 2.132 tons trammed per man-hour, or 0.468 man-hours per ton trammed.

8. Percentage of mine labor on basis of total man-hours, 38.43 per cent; mill crew, 34.90 per cent; surface, office, and others, 26.67 per cent.

9. Labor turnover amounted to 708 men in the year out of an average of 397.67 employed.

10. Total mine labor cost was $326,533.81; total cost of mining $568,682.15; labor equaled 57.4 per cent of total mining cost.

11. Mining supplies totaled 964,650 lb. of explosives, 3,791 boxes of caps, 226 cases (1,356,000 ft.) of fuse; ratios per ton trammed were 0.389 lb. of powder, 0.0153 boxes of caps and 5.476 ft. of fuse.

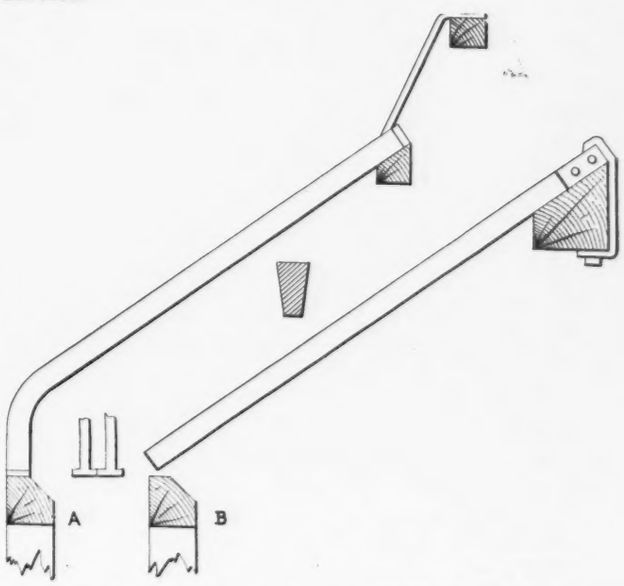
12. Yearly horsepower hours totaled 6,940,455; ratio to ore tonnage trammed equaled 2.80 hp.-hr. per ton trammed. Total horsepower equaled 792; for compressed air 1.85 hp.-hr. per ton trammed; haulage, 0.83 hp.-hr. per ton trammed; ventilation, 0.05 hp.-hr. per ton trammed; lighting, 0.70 hp.-hr. per ton trammed. The distribution of power was: Total, 792, divided into compressed air 525, haulage 235, ventilation 12, and lighting 20.

13. Total cost of mining supplies was $70,024.78, or 12.31 per cent of total mining cost.

Non-Clogging Grizzlies

Two types of grizzlies have been developed at the Alaska Juneau mill in an endeavor to obtain a non-clogging grizzly. The Type A consists of a bar of tapered cross-section which is curved as shown at the discharge end. The lower ends of the bars are upset and widened out so as to give the proper spacing between the bars. The upper ends are held by a rod and spacers.

The length of the grizzly is relatively short. In the second type the upper ends of the bars are held by rods and spacers and the grizzly is firmly attached to the upper support. The lower ends of the grizzly bars are free and unsupported. This arrangement allows the bars to spring apart slightly under impact, assisting in keeping the spaces clear. The length of this type is relatively short. Both types have given satisfactory service.



Two types of non-clogging grizzlies used in Alaska Juneau mill

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief.

Mining Education in California

THE EDITOR:

Sir—The last issue of the *Mining Journal-Press* arrived today, and I would like to answer an article in that issue under the heading "Discussion."

N. E. Guyot, prospector, of San Francisco, makes the statement that out of the 2,155 students graduating with this past class from the University of California there were forty lawyers and one mining engineer. He is correct in that statement, but I do not think he has searched far enough through the list of graduates to determine that there were forty-four names listed of students that received their bachelor's degrees from the College of Mining.

The degree of "Mining Engineer" is an advanced degree conferred by the university. In the list of candidates for degrees we find that the degree of Mining Engineer was conferred on John Franklin Dodge, of Berkeley. He submitted as his thesis, "The Valuation of Fuel Lands, With Particular Reference to Their Appraisal for Federal Income Tax Purposes." I believe that the subject shows "that he will not degenerate into a mere mining auditor."

During the last year there were about one hundred and fifty students enrolled in the four classes in the College of Mining, so I think that there will be a considerable time before "the last lone hope of the University of California" graduates.

Berkeley, Calif. HOLT H. WELLANDER.

Assessment Work in Alaska

THE EDITOR:

Sir—In your issue of March 22, 1924, there appears an article by J. W. Thompson entitled "An opinion as to the law on the assessment work on mining claims in Alaska." In it two conclusions are set forth upon subjects of primary importance to the mining fraternity of Alaska. The first subject is that portion of the act of Congress of Aug. 1, 1912, which is Section 129a of the Compiled Laws of Alaska, and reads as follows:

"Section 129a (C. L. A.): That no association placer mining claim shall hereafter be located in Alaska in excess of forty acres, and on every placer mining claim hereafter located in Alaska, and until a patent has been issued therefor, not less than $100 worth of labor shall be performed or improvements made during each year, including the year of location, for each and every twenty years or excess fraction thereof."

The conclusion drawn by the writer is, in substance:

(a) That the word "year" as used in the act means the year commencing with the date of location of each claim and the anniversary thereof.

(b) That the calendar year for doing assessment work never applied to placer mining claims located in Alaska after said act became operative unless the claim happened to have been located upon Jan. 1.

(c) That the fiscal year for doing assessment work as established by the act of Congress of Aug. 24, 1921, does not apply to placer mining claims located in Alaska since the act of 1912, unless the claim happens to have been located upon July 1.

Such a decision is reached by Mr. Thompson by assuming that the words "each year" used by Congress in the act of 1912 clearly mean the year following the date of location, and that no effect is to be given to the amendatory act of Congress of Jan. 22, 1880, which reads as follows:

"Provided, that the period within which the work required to be done annually on all unpatented mineral claims shall commence on the first day of January succeeding the date of location of such claim, and this section shall apply to all claims located since the tenth day of May anno Domini 1872."

ADVANTAGE OF DOING ASSESSMENT WORK IN CALENDAR YEAR

From the passage of the act of 1912 and until 1921 the courts, attorneys, and mining men of Alaska uniformly assumed that the act of Aug. 1, 1912, set the calendar for the doing of assessment work, and proceeded accordingly. The result is that if each claim has its own particular annual labor year there are many claims open to location under another law of Congress, which makes the failure to do annual labor in Alaska work a forfeiture of the claim, which no resumption of labor can cure.

For example, a claim located in November of 1912, on which the locator did the annual labor in that month for the calendar year of 1912, and did the 1913 annual labor in June of 1913, and the 1914 annual labor in December of 1914, would lack labor during the year from November, 1913, to November, 1914. Thus the doing of annual labor during each calendar year would not suffice if the year measures from the date of location of this particular claim. It would therefore be seen that a decision of this matter is imperative to the stability of placer mining titles in Alaska.

In the opinion above mentioned it is correctly announced that the act of Aug. 1, 1912, applying specially to Alaska, would control over general mining laws of the United States. The error creeps in when there is an assumption that a conflict exists between the act of 1912 and the amendatory act of Jan. 22, 1880. I see none. On the other hand, I find in the act of Jan. 22, 1880, and the judicial interpretations of it, and other annual labor statutes, a direct and positive guide to the meaning of the words "each year" as used in the act of 1912, which harmonizes those two acts and establishes the calendar year for the doing of annual labor in Alaska as in other parts of the United States.

By direct enactment in 1900 Congress made the general mining laws of the United States applicable to Alaska, and they have been ever since (Section 129, C. L. A.).

As all statutes are presumed to have been enacted by the law-making power with full knowledge of the existing condition of the law and with reference to it, they are to be construed as a general and uniform system of jurisprudence, and their meaning and effect to be determined in connection with all other statutes on the same subject (36 Cyc. 1146).

The rule is likewise definitely established that where words are given a special meaning in a prior statute the same meaning will be attached to the word when used in a later statute, unless it is apparent that a different meaning was intended (Reiche v. Smythe, 13 Wall. 162); and "it may be admitted that when in a later act Congress uses expressions that had a recognized meaning in a former act relating to the same subject, they intended to use them in the same sense in which they were first used" (Greenleaf v. Goodrich, 101 U. S. 278). And again, where the meaning of words in a prior statute has been ascertained by judicial interpretation, they will be understood to have been used in the same sense by the law-making power when they appear in a subsequent statute, unless the contrary plainly appears (Kepner v. United States, 195 U. S. 100).

In 1907 Congress passed a law on the subject of assessment work in Alaska, which is now Section 162, Compiled Laws of Alaska, and reads as follows:

"Section 162: During each year, and until patent has been issued therefor, at least $100 worth of labor shall be performed or improvements made on, or for the benefit or development of, in accordance with existing law, each mining claim in the District of Alaska heretofore or hereafter located. . . ."

As this act was especially for Alaska, there was the same reason for interpreting these words "each year" as meaning the year commencing with the date of location as there is to give that meaning to the same words in the act of 1912. Yet the courts of Alaska, the attorneys, and miners acted upon the interpretation that the calendar year was meant by the act of 1907, and the United States Circuit Court of Appeals for the Ninth Circuit, which is the appellate court for Alaska, coincided with that view in the case of Brown v. Thatcher, 190 Fed. 708.

Litigation Clarifies Interpretation of Various Federal Statutes

When the act of Aug. 1, 1912, was passed, Congress had before it the amendatory act of Jan. 22, 1880, declaring the calendar year to be the year for doing annual labor; it had before it the act of 1907 relating to assessment work in Alaska above mentioned, and the judicial interpretation of Brown v. Thatcher, showing conclusively that the calendar year had been read into the words "each year" in that act. Consequently, it will be presumed that in using the words "each year" in the act of 1912 Congress thought their meaning was established and well known, and that they meant the calendar year.

Supporting the above interpretation are the instructions of the United States Land Office in circular No. 186, of date Oct. 29, 1912. The First Assistant Secretary of the Department of the Interior gave his interpretation of the act of Aug. 1, 1921, stating:

"Said section further provides that on every placer mining claim located in Alaska after the passage of the act, and until patent therefor has been issued, not less than $100 worth of labor must be performed or improvements made during each year, including the year of location. This means that the first annual expenditure on such a placer mining location must be accomplished for and during the calendar year in which the claim is located instead of during the calendar year succeeding that in which the location is made."

The above circular and its interpretation has at all times been and now is in force in the Land Department of the United States, which has always required the doing of assessment work during the calendar year in Alaska prior to the act of Aug. 24, 1921.

Indeed, the act of Aug. 1, 1912, in stating that the labor should be done during each year, "including the year of location," clearly points out that Congress intended the word "year" to mean calendar year; otherwise the phrase "including the year of location" would have no meaning whatever. If Congress had intended the interpretation announced by Mr. Thompson there could not possibly have been any occasion to say "including the year of location." On the other hand, knowing that the amendatory act of 1880 fixed the calendar year for doing assessment work, and postponed the time for so doing it until the calendar year following the calendar year of location, there was a distinct meaning and effect in the words "including the year of location."

Territorial Legislature Defines Meaning of Law

The Legislature of the Territory of Alaska expressed its interpretation of the above matter in the following words:

"No association placer mining claim shall hereafter be located in Alaska in excess of forty acres, and on every individual or association placer mining claim located in Alaska after Aug. 1, 1912, and until patent has been issued therefor, not less than $100 worth of labor shall be performed or improvements made during each *calendar* year. . . . (Section 3, Chapter 10, Session Laws of Alaska, 1915.)"

It therefore appears to me that the general use of the calendar year for assessment work in Alaska has been justified, and that the words "each year" used in the act of 1912 meant only the calendar year.

And finally, as it was the act of Jan. 22, 1880, which gave the meaning of calendar year to the words "each year" in the Alaskan act of 1912, it follows without argument that the amending of the act of 1880 by the act of Aug. 24, 1921, thereby changing the annual assessment period from the calendar to the fiscal year, establishes the fiscal year in Alaska for the doing of all assessment work.

Does the act of Aug. 24, 1921, do away with the necessity of performing annual labor on a mining claim for the year of location is a question which Mr. Thompson answered in the negative in the above mentioned article. That act provides:

"That the period within which work required to be done annually on all unpatented mineral claims located since May 10, 1872, *including such claims in the Territory of Alaska*, shall commence at 12:00 o'clock meridian on the first day of July succeeding the date of location of such claim."

The locators of placer claims in Alaska, therefore, immediately want to know whether or not they are required to do annual labor on their new location during the fiscal year of their location. Mr. Thompson's argument was that the act of 1921 was general; that the act of Aug. 1, 1912, was special and local to Alaska, and controllingly prescribed the year following the date of location as the time for annual labor.

Again the conclusion is shifted from one point to another by a different classification.

There is no doubt as to the local character of the act of 1912, but when Congress put the words "including such claims in the Territory of Alaska" in the act of 1921 Congress gave it the same force it would have had had it been passed specially for Alaska and Alaska only. The attention of Congress was thereby directly called to Alaska, and its pronouncement upon the subject became its last expression, which would control.

It is true that the title of the act of Aug. 24, 1921, mentions only the purpose of changing the annual labor from the calendar to the fiscal year, but Congress is not required to make the titles of its acts express the subjects treated. That burden is imposed only upon state legislatures. In fact, it is an extremely rare instance in which the title of a Congressional act is broad enough to include all subjects treated therein.

Equally true is it that there is no repealing clause in the last-mentioned act and that repeals by implication are not favored, but these matters are necessarily to be considered only when Congressional intention is in doubt. If it is clear, all repugnant laws are thereby repealed regardless of repealing clauses.

Effect of Various Congressional Acts

The original section, 2324 R. S. U. S., required annual labor to be done upon the claim during the year of location, which commenced with the date of location.

The amendment of Jan. 22, 1880, changed the year to the calendar year, and by implication, and without a repealing clause, excused any annual labor in that part of the claim's annual labor year which fell within the calendar year of location (Lindley on Mines, Sec. 623, Third Edition, and cases therein cited).

As the act of 1921 recites that the annual labor period "shall commence at 12:00 o'clock meridian on the first day of July succeeding the date of location of such claim," the necessary result is to repeal the repugnant portion of the act of 1912 requiring assessment work during the year of location. This construction only gives to this act the same force as was given to the amendatory act of 1880.

Because the act of Aug. 24, 1921, is remedial in its nature, Mr. Thompson, with the premise that the annual labor year for placer claims in Alaska commenced with the date of location, necessarily arrived at the conclusion that the act did not affect those placer claims located since 1912, as so to do would not have been lifting any burden from the owners thereof.

On the other hand, if the calendar year was the unit for the doing of annual labor upon placer mining claims, the act of 1921 was indeed remedial. It gave the locator a period of grace extending from the date of his location to the first of the next July; it gave him the opportunity of thereafter doing two years' annual labor in one working season. Thus, as the summer is the sluicing season for placer mining, the owner, by working during June and July of the same year, could thereby do two years' assessment work instead of only one were the calendar year the unit.

The final conclusion, therefore, which enforces itself upon me as to the act of Aug. 24, 1921, is: That the words "including such claims in the Territory of Alaska" necessarily make the act apply to Alaska and establish the fiscal year as the period for annual labor; that the words "the period within which the work required to be done annually on all unpatented mineral claims . . . shall commence . . . on the first day of July succeeding the date of location of such claim" necessarily repeal the provision of the 1912 act, which requires assessment work during the year of location of the claim; that the remedial character of the act of 1921 be given effect by allowing it to remedy the somewhat onerous duty of doing annual labor during the year of locating the claim and allowing it to substitute for the calendar year the better adapted fiscal year for the doing of annual labor.

HARRY E. PRATT.

Fairbanks, Alaska.

Oil in New Guinea

THE EDITOR:

Sir—A note on page 901 of your May 31 issue, that an expedition is to be made into the interior of Papua in search for oil and that the British Development Co. was the first corporation to obtain an oil concession there under the mandate issued by the League of Nations, prompts an explanation. The League of Nations has no control over Papua, nor are any concessions granted there under its mandate.

In view of the latent possibilities of what is usually considered the largest island in the world, with an immense area of unexplored territory in a fertile and mineralized region, it may be of interest to review briefly its history: New Guinea remained neglected for several centuries after its discovery early in the sixteenth century, because of the unhealthiness of the climate, the difficulties of navigation, and the cannibalism of the natives. In 1793 it was annexed by two commanders in the service of the East India Company, an act that was not taken seriously. In 1884, in consequence of colonial foresight and persistence, a British protectorate was proclaimed over the region to the east of the 141st meridian, as far as East Cape, and including many islands. In 1885, Germany, Great Britain, and Holland agreed to a division of the country that gave the Dutch the western part—about one-half the total area, or all the territory west of the 141st meridian. The Anglo-German boundary was not definitely surveyed until 1909.

The protectorate known as British New Guinea was subsidized by Queensland, New South Wales, and Victoria until 1888, when it became a crown colony, but administered from Queensland. When I was there in 1902-03 the total white population was about 200; about that time the territory became a dependency of the commonwealth, to be known thenceforth as Papua, the native name of the island. In September, 1914, the acting governor of German New Guinea capitulated to the leader of a British expedition sent from Australia. In 1920 the League of Nations allotted German New Guinea to the commonwealth, to be administered under mandate. This is now known as the Territory of New Guinea, the portion to the west being Dutch New Guinea and the original British colony retaining the name of Papua.

The prospecting expedition sponsored jointly by the commonwealth government and the Anglo-Persian Oil Co. in 1921 examined about 2,000 square miles of the former German colony, along and inland from the northeastern coast line. It would appear that the new expedition will investigate geological conditions in the region of the headwaters of the Sepik River, in the Territory of New Guinea, to be reached from Dutch New Guinea, where oil has already been found.

San Francisco, Calif. A. W. A.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

THE Horse Mesa dam power contract has been signed and will enable the Inspiration Copper Co., in Arizona, to satisfy its power requirements.

The Hecla Mining Co. has driven the long Star crosscut to its objective and is preparing to develop the Star vein.

Despite the low price of zinc, intensive prospecting is being done in the Joplin-Miami district.

The high price for quicksilver has stimulated mining for the metal in Texas. Old mines are being reopened.

Grass Valley, Calif., a famous old gold-mining camp, contains inducements to further developments. Present activity restricted to a few mines.

The Newport iron mine, in Michigan, has curtailed its operations.

More interest is being shown in the non-metallic minerals of western Canada, especially clay and salt.

It is reported that the Tonopah Divide and Tonopah Midway mining companies of Nevada will merge.

Magnesite mining in California is quiet, but many producers are active.

Mining in Philippines quiet. Benguet Consolidated is the largest property.

Portland Gold Mining Co., in Cripple Creek, is increasing its output.

The Nipissing Mining Co. has leased the Aladdin claims.

No. 4 shaft of the Ibex Mining Co., of Leadville, has been destroyed by fire.

Magnesite Mining in California Hampered by Freight Rates

The magnesite market on the Pacific Coast is quiet. Rutherford and Mendota have shut down temporarily and Livermore is operating at half capacity. Sierra Magnesite, at Porterville, has reduced output to half capacity. Unground caustic magnesite is selling at from $30 to $35. The lack of a reasonable freight rate to Chicago markets is keenly felt by California magnesite producers, as the local coast demand fluctuates. If opportunity of competing in Mid-West markets becomes available through lowered freight rates the industry will be placed on a more substantial footing. Normally, about 600 workers are employed, but owing to curtailment fewer men are now needed.

Importations of caustic magnesite on the Atlantic seaboard have increased, and as such magnesite is sold at a low price it shuts out most of the eastern market from the producers located on the Pacific Coast.

Claim Owners Relieved of Protest Expense in Homestead Conflicts

Secretary Ravenel Macbeth of the Idaho Mining Association has secured information about the conduct of contests before the federal officials in which mining claims conflict with homestead entries. He has learned that the claim holders need not go to the expense of retaining legal assistance.

Protests in these cases should not be made in the local land office, but a simple statement of the facts should be made to the chief of the field division. It is not necessary for the claim owner to incur the expense of retaining an attorney. A field examination will be made upon the representations of the claim owner; and if the conflict should go to a hearing before the local land office, the claim owner—instead of being called upon to stand any expense—will be subpoenaed by the government as a witness.

W. E. Soast Killed, David Cole Injured, in Automobile Accident

Walter E. Soast, general superintendent of the El Potosi Mining Co., of Chihuahua, Mexico, is dead, and David Cole, consulting engineer, of El Paso, is seriously injured as a result of an automobile accident that happened while the two men, in company with Mrs. Cole and Mr. and Mrs. Cole's little son, were returning to El Paso after a tour of California and Arizona mining districts. The car, which was driven by Mr. Soast, was overturned as an attempt was made to pass another car. The injured man was rushed to the Calumet & Arizona Hospital, at Bisbee.

At the place where the accident happened, near Apache, Ariz., it was possible to stop the passing Golden State Limited train to bring the injured man to Bisbee.

Mr. Cole had recently been at the El Potosi property, where he is designing the new 600-ton concentrator.

Benguet Consolidated Principal Producer in Philippines

With the exception of the Benguet Consolidated Mining Co.'s activities, little mining is being done in the Philippines. The gold dredging operations at Paracale and Sirigao have ceased, owing to exhaustion of the areas. At Aroroy, Masbate, the Colorado has quit, through exhaustion of its orebodies and failure to find anything else in the district worth while. The Syndicate is still operating on a small profit margin, on low-grade ore. It has managed to pay one dividend of 5 per cent last year.

There is little activity in Benguet, outside of that of the Consolidated. The only other locality in which interest is being shown is in the Suyoc district, in northern Luzon, where the only copper deposit of consequence in the islands is located—the Mancayan—and here the interest is directed to the gold-bearing veins, long known to carry high-grade ore in small deposits, but held under locations by prospectors who have been in the district for twenty-five years. It is a district with poor communications, reached only by trails. It is, however, promising as a possible field in the future.

Chateaugay Concentrator Burns

Fire recently destroyed the five-story magnetic iron-ore separator of the Chateaugay Ore & Iron Co. at the Lyon Mountain plant, New York. The loss is estimated to be $300,000.

Portland Gold Mining Co. Increases Production

By the first of July the Portland Gold Mining Co., at Cripple Creek, Colo., expects to have its mill working at full capacity of approximately 750 tons daily, which will almost double the present output.

The No. 2 Independence shaft has been retimbered and repaired, and new equipment installed, which will materially reduce the operating expenses in handling the low-grade product from the old workings. The company expects to complete the main shaft to the 3,000 level about September first.

Newport Iron Mine Cuts Operations

The Newport mine, at Ironwood, Mich., operated by Pickands, Mather & Co., and employing about 580 men, has cut operations to four days a week and stopped all overtime and night work. For some time only a small crew has been employed on the night shift, drilling, blasting, and repairing, but the day shift men were allowed to put in overtime almost as they wished. All this has been stopped and about eighty men have been laid off. This action follows closely upon the closing by Pickands, Mather of the company's Cary mine at Hurley, Wis.

The other large Pickands Mather underground mine on the range, the Anvil-Palms, is still working six days per week, although the night crew was laid off a number of weeks ago. Only a small amount of ore has been shipped from the stockpiles at Newport so far.

Repairing of the Puritan No. 1 shaft for about 600 ft. below the 18 level is progressing at a rate of over 100 ft. per month. This section of the shaft was completed only last winter, but the steel sets were bent by the swelling slate. Now the pressure is being relieved, the sets are being taken out and straightened, and the shaft is to be given a new coat of gunite. Gunite was applied as the shaft was being sunk, but failed to prevent the swelling of the slate.

Newray-Coniagas Merger Details Announced

The agreement for a merger between the Newray, Strong Bow, Goldale, and Coniagas mining companies of Ontario, has been followed by a second agreement between the Newray and the Coniagas, under which the Coniagas agrees, instead of taking its pro rata share of the new stock, to allow 749,500 shares to be divided among Newray shareholders, other than the Coniagas, so that each shareholder will receive half the amount of stock in the new company that he now has in the Newray, the balance (after payment of compensation to the president) for negotiating the contract to go to the Coniagas.

President J. E. Day of the Newray states that since the first agreement was made, including in the properties of the merger a three-quarter interest in the Armstrong-Booth claims, the entire Armstrong-Booth property has been secured.

Real Daylight Saving on the Alaska Railroad

SWITCH lamps on part of the main line of the Alaska Railroad have been turned out and will not be lighted again until the end of the present summer, according to the Interior Department.

Three months and a half of daylight in the Alaska territory without intervention of darkness makes it unnecessary to burn these lights that give the danger signal of open switches. The Alaska Railroad is the only one in America where such a condition exists that switch lamps may be turned off at any time at night, as all other roads must burn them regularly throughout the year.

The report says that a considerable economy will result, as the cost of the oil consumed will be saved as well as the labor entailed in filling and lighting the 100 switch lights every night.

Star Crosscut at Its Objective—Further Development Needed

The Star crosscut of the Hecla Mining Co., at Burke, Idaho, has been driven to a point vertically below the exposure of the vein in the upper Star works and about 290 ft. beyond. In the area in which the company expected to find the Star vein, over a width of 400 ft., are a series of fissures, at least four, all of which contain less than commercial amounts of lead, zinc, and silver.

The crosscut enters these veins at a point 2,000 ft. west of the westerly end line of the Morning mine of the Federal Mining & Smelting Co., which has mined on this same vein for a length of about 2,000 ft. and a depth of more than 3,500 ft.

Openings from the Morning mine have been made into Star ground on this vein in ore for a distance westerly from its end line of 1,000 ft. A drift on this vein easterly from the Star crosscut for a distance of 1,000 ft. will be required to reach this same point approximately 1,400 ft. deeper.

Before doing this drifting it has been decided to continue the crosscut in approximately its present direction until the San Jose vein, which was exposed in the upper Star works about 1,000 ft., is reached south of the Star vein. This vein was barren in the upper works, but it is considered advisable to prospect it at this depth. This decision has been reached after an examination of the crosscut with F. W. Bradley, president, and S. A. Easton, manager of Bunker Hill & Sullivan, and after full discussion with them. The Bunker Hill & Sullivan company has an equal interest with the Hecla Mining Co. in this development.

Kay Copper Finishes Shaft Sinking

The Kay Copper Co. has just completed sinking its shaft from the 700 level to the 1.220 level. This mine, which is at Cañon, Ariz., about 40 miles north of Phoenix, was idle for some time, but a reorganization that was effected a few months ago has placed the company in position to proceed with an extensive plan of development. The sinking of the shaft was the first work accomplished, and exploration work of the new territory thus made accessible will be rushed. The shaft work was in charge of "Slasher" Harrington, of Miami, who recently completed the new Porphyry shaft at Inspiration.

High Price of Quicksilver Stimulates Texas Mining

Big Bend and Almaden Companies May Begin Production in the Near Future

Revival of interest of quicksilver mining in the Terlingua district, in Texas, is apparent by the purchase of several undeveloped claims and preparations that are being made to reopen properties that have been closed down for some time. It is said that pumps will be installed for the purpose of unwatering the mines of the Big Bend Mining Co. and the Almaden Mining Co. The underground workings of these two mines have been flooded for several years. At the time the Almaden mines were shut down a body of rich cinnabar ore was being worked, but it was found that the low price of quicksilver and the high cost of production did not justify continuing operations. The same was true of the Big Bend mine. Both of these companies used coal, which is found in the neighborhood in large quantity.

The Chisos mine, owned by the Chisos Mining Co., is the most productive quicksilver property in the Terlingua district. It has produced a total of more than 15,000,000 lb. of quicksilver, and the orebody is said to be far from exhausted. It contains more than thirty miles of underground workings and is the second largest cinnabar mine in the world. It was quite by chance that this mine had its beginning. About twenty years ago a Mexican goat herder came across an outcropping of red colored ore. He took a sample to Marfa, the nearest railroad town, 90 miles away, and the man to whom he showed it sent it to El Paso to be assayed. It was found to be very rich in quicksilver. Several years before that H. E. Perry, of Chicago, had purchased two sections of land, each of 640 acres, located in the Big Bend country, for $150. It was upon one of these sections that the cinnabar outcropping was found. The first that Mr. Perry knew of the discovery was when a man from Marfa entered his office in Chicago one day and offered him fifty thousand dollars for the two sections. Mr. Perry had almost forgotten that he owned the land; he regarded it as practically worthless. The unexpected offer of such a big sum for the land aroused his suspicions, and he came to the district and investigated the matter. He then learned of the quicksilver discovery, and immediately started to develop the rich ore deposit on his own account. He organized the Chisos Mining Co., installed a furnace, and made a fortune in quicksilver in a few years.

The town of Terlingua and adjacent

quicksilver mines are situated within 6 to 10 miles of the Mexican border and nearly 100 miles from a railroad. Although the region outside of the mining district has been prospected but little, a number of rich cinnabar ore outcroppings have been found, and development of some of them will be started when the price of quicksilver increases to a point that will justify the work. On the Mexican side of the Rio Grande many quicksilver claims also have been located during the last few years, but they are so remotely situated from transportation that no steps toward their development have been taken.

Ahmeek Operations Remain Curtailed

The Ahmeek mine of the Calumet & Hecla Consolidated company, in Michigan, although still on a curtailed production basis, is up to 1,780,000 lb. of refined copper per month. Nos. 2 and 4, the operating shafts, have practically a full complement of men, a number of experienced miners formerly employed at the Seneca having been employed.

Development work is being kept well ahead of requirements. To the south, connections have been established on several levels of No. 2 shaft with Allouez workings. Allouez ground to the north can be economically handled through No. 2 Ahmeek when metal-market conditions warrant the mining of Allouez rock. Allouez territory to the south will be mined through North Kearsarge drifts which have been extended northward.

Operations on the rich mass fissure vein in No. 2 shaft are confined largely to drifting and stoping. Shipments from the fissure vein are comparatively small, this ground being held in reserve. Production can be easily increased in Ahmeek when the price of copper warrants it. The mine continues to operate on a five-day-week basis.

Ibex Shaft and Surface Plant Destroyed by Fire

On the night of June 14, a fire destroyed No. 4 shaft of the Ibex Mining Co. at Leadville, Colo. The fire greatly damaged the shaft, consumed the headframe and the engine and compressor house, and about 300 feet of Rio Grande snow shed. Fifteen men were laid off until new equipment can be installed. Manager Cortellini expects to have the plant in operation in about thirty days.

Equipment for Danielsville Mines Soon

A crew of men are working on a three-mile stretch of road between the Brown Bear mine and Danielsville, Mont., getting it into condition for the hauling of heavy machinery. C. R. Holmes, of London, the representative of a British syndicate that recently took over a group of claims in this district. is on his way to the property. He writes that the equipment for operating the mine has been ordered and is ready for shipment.

New Ore Found at Cripple Creek Netting Over $20 Per Ton

OPERATIONS by the Anaconda Leasing Co., below the Anaconda Tunnel at Cripple Creek, Colo., where a strike was made in April in territory which had not been considered productive, continue to show favorable results, and the shipments it is said will soon reach about one carload daily. Shipments are now coming from a stope 12 ft. wide and about 35 ft. long. The settlements are averaging better than $20 per ton.

Michigan Conglomerate Yielding Well in Depth

Owing to an increase in underground efficiency, rock shipments have increased from the conglomerate branch of Calumet & Hecla Consolidated, the average now being about 3,000 tons per day. The yield is approximately 2,400,000 lb., refined, per month. Though the great bulk of the rock is coming from arches and backs of stopes and shaft pillars in upper levels, ground of splendid quality continues to be opened at great depths, below the 83d level both north and south of No. 7 shaft and north of Nos. 9 and 10. No. 6 also is developing well at depth. Practically all of the conglomerate shafts are furnishing considerable tonnages from the upper levels.

Intensive Prospecting for Lead and Zinc in Joplin

Extensive efforts to locate orebodies to the north and east of the Picher-Baxter formations are being made by the large companies in this field. The latest development in this work is the announcement of the taking over of 2,000 acres in leases from Victor Rakowsky by the Admiralty Zinc Co., in the section north and west of Chitwood, Mo., a suburb of Joplin, extending to a point just south of Carl Junction, Mo., northwest of Joplin. Six drill rigs have been moved to this acreage by the Admiralty company, according to announcements of E. F. Blaise, vice-president, and M. F. Lawrence, general manager.

The Bilharz Mining Co. and the Kansas Explorations Co. are also drilling on acreages they have obtained in recent months on lands in Missouri and Kansas, situated between Crestline, Kan., and Webb City, Mo. It is unofficially stated that the Kansas Explorations Co. already has expended approximately a million dollars in drilling in this field, and is continuing its campaign with no slowing up of enthusiasm.

Prospect drilling in the face of drifts is being tried out in this field for the first time. Recently a Waugh Turbro Model 34 hammer drill was used to drive two holes in the face of drifts of the Commerce Mining & Royalty Co.'s Gordon-McBee mine, in Oklahoma. John W. Newton, manager, says that the work was entirely satisfactory.

Get $600,000 Electrical Contract

A $600,000 contract for electrical and mining equipment for El Potosi Mines, in Mexico, has been placed with the International General Electric Co. and Allis-Chalmers Manufacturing Co. by the Howe Sound Co.

The order, of which the International General Electric's share is $500,000, includes electrification of the railroad at the mines at a cost of $350,000. It calls also for five twenty-five-ton electric locomotives, substations and overhead construction.

Quincy Specializing in Development Work

An important factor in Quincy mining operations, in the Michigan copper district, is the amount of development work being done in the two producing shafts, Nos. 2 and 6. Total openings in 1923 were 10,012 ft., nearly 1,500 ft. more than in the preceding year. Quincy conducted one of the most vigorous development programs in the Michigan district and is still continuing this policy. It accounted for approximately $154,000 of the expense of the 1923 operations and though it figured in the year's deficit of about $279,000, Quincy will benefit from this extensive opening work when production is increased and the price of copper strengthens.

The vein at depth is rich in stamp rock and heavy mass copper. The present yield, averaging 23.78 lb. of refined copper per ton, is the best in Quincy's history and almost a pound more than in 1922. The main east branch of the Pewabic bed contains the best grade of stamp rock and a large percentage of mass. The west branches are bunchy but productive of some very good rock.

On its present showing of reserves, Quincy should be able to maintain the prevailing high yield per ton, or even better it, for many years. The decrease in production in 1923, of about 2,500,000 lb. as compared with the 1922 output, resulted in a higher cost per lb. and to overcome this it is the intention of the management to recruit the underground force in both shafts up to normal with experienced men this summer. The shafts are operating 85 per cent of capacity.

Black Bear Shutdown Cuts Shipments from Telluride

Shipments of ore and concentrates from the Telluride district during May amounted to 126 cars, as compared with 153 cars in April and 124 cars in May, 1923. The decrease was caused principally by the closing down of the Black-Bear. It is thought that production from smaller properties which are just beginning to output will show a material increase during the summer.

Argonaut Meeting Expenses

During May, production from the Argonaut, near Larder Lake, Ont., was $20,000, which was sufficient to pay operating costs. The mill is treating approximately 100 tons a day and the ore is running about $8 a ton.

Grass Valley Shows Mixed Activity

Famous Old California Mining District Contains Inducements to Further Development

By George J. Young
Associate Editor

MINING activity on more than a nominal scale in the Grass Valley and Nevada City districts has been restricted to three mines, the Empire, the North Star, and the Idaho Maryland. The Empire has been prosperous; the North Star has been struggling to overcome its development deficiency incurred during the war period, and the Idaho Maryland has been engaged in an exploration campaign that has involved considerable money outgo and relatively small returns.

For the most part the surrounding area contiguous to these three mines has been inactive until recently. A number of small properties have been rehabilitated, and more or less active exploration is now in progress. In addition, there has been a consolidation of old properties into several groups which are in the throes of preliminary financing or sale. About 1,100 workers are now employed in the district.

North Star mine

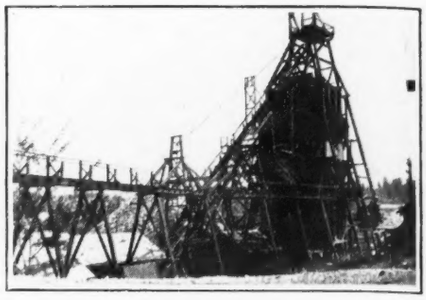
The Golden Center mine, which is within Grass Valley, has been unwatered to 1,160 ft. on its incline shaft (663.5 ft. vertical), and tributers are working in the mine, producing ore that is sufficient to keep ten stamps of the twenty-stamp mill in operation. Preparations are being made to sink and explore the vein at depth. The property is under the control of M. K. Harr.

The Brunswick mine, east of Grass Valley, was recently equipped with a new hoist and unwatered. Negotiations for the sale of this property are under way, and in the meantime it is being kept free from water. The surface plant and twenty-stamp mill are modern and in excellent condition.

The reopening of old properties west of Grass Valley is of considerable interest as a number of quartz veins have been in times past opened to shallow depth and more or less ore produced, but no persistent attempt has been made to explore the ground thoroughly. These properties include the Alcalde, which is 450 ft. in depth and is equipped with a ten-stamp mill; the Normandie-Dulmaine, about 300 ft. in depth and at present under development; the California, 600 ft. in depth and not being worked; the Osceola, under bond but inactive as yet; the Tonopah North Star, 250 ft. in depth and under development; the Gold Wedge, 200 ft. in depth and being developed; and the Newtown, equipped with a ten-stamp mill, 135 ft. in depth, and being developed.

There are several other properties in the Deadman Flat and Rough and Ready areas. A townsite (Gold Strike) has been surveyed in the vincinity of the Newtown mine. The outcome of this activity in the western part of the district will depend upon the financial strength of these companies and the persistance shown in exploration. There are many veins. Whether they contain commercial ore can be determined only by well-directed work.

Brunswick mine and mill



Golden Center mine

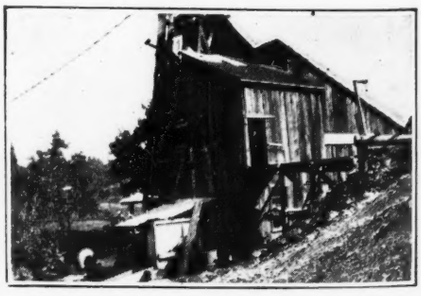
South of Grass Valley, the Ben Hur Divide Mining Co. is reopening the Ben Franklin property. A few men are at work on the Sultana, near the south boundary of the Empire. The Norambagua, an old property, is idle and the Syndicate Consolidated, adjacent to the old Allison Ranch mine, is likewise idle. The Ben Hur has milled ore taken from the Ben Franklin.

Mining Ground Held Under Option

Two areas northwest of Grass Valley are held under option, but no work is being done. The Grass Valley Extension Mines Co. holds under option 1,700 acres, and is in the promotion stages. The Grass Valley Mines optioned 200 acres on Alta Hill, but the original owners are now seeking through the courts the return of their properties.

In the Nevada City district two important option groups have been formed. One is the Champion-Providence group, options on which have been obtained by Dr. Carl P. Jones and W. H. Martin. Both of these men are endeavoring to revive the dormant mines of Nevada City. The properties in question were worked for a long time, but the Champion and Providence, both operated by the North Star company, were closed down several years ago, partly as a result of war conditions. The outcome of the present effort appears to depend upon the financing of the options and the operation of the property by a strong mining company. The other group is the Banner Consolidated, which holds about 1,000 acres at Banner Mountain. A company was formed, but internal difficulties are in process of adjustment, and no actual work is now being done, although 1,700 ft. of development was accomplished last year.

The three large operating mines in the district are in strong hands and



Newtown mine

Empire mine

have sufficient backing to overcome periods of ore scarcity. Both the Empire and North Star mines have reached a vertical depth of approximately 3,000 ft., or over 6,000 ft. on the slopes of their respective vein systems. A recent discovery of a north-south oreshoot on the 6,300 level of the North Star has so encouraged the management of the mine that plans are in process of formation to extend the central shaft to an ultimate depth of 3,600 ft. vertically. Final decision awaits further development of this oreshoot. By a persistent development plan comprising approximately 12,000 ft. per year, the Empire has maintained its ore reserves consistently. The results of the deep development at these two properties have encouraged mining men to believe that other vein systems in the district warrant deeper development.

The experience of the North Star at the Champion-Providence, where about $2,000,000 was spent and $1,000,000 taken out, and of the Metals Exploration Co. at the Idaho-Maryland, at which approximately $1,500,000 was spent and more than $100,000 taken out, has deterred mining companies from undertaking similar enterprises in the district. However, when these two enterprises are examined in detail their apparent failure does not appear in an extremely unfavorable light. War conditions played a considerable part in the abandonment of operations in the Champion-Providence. Low-grade ore was found, but costs were high.

The resources of the North Star company were needed for the further development of the North Star, and the decision to concentrate on one property was probably a wise one. The Idaho-Maryland project required what was probably an excessive expenditure for property as well as large expense for equipment, unwatering, and underground rehabilitation. A short oreshoot was discovered, and further development may entail a relatively small expenditure. The outcome will depend upon the success of the development now in progress.

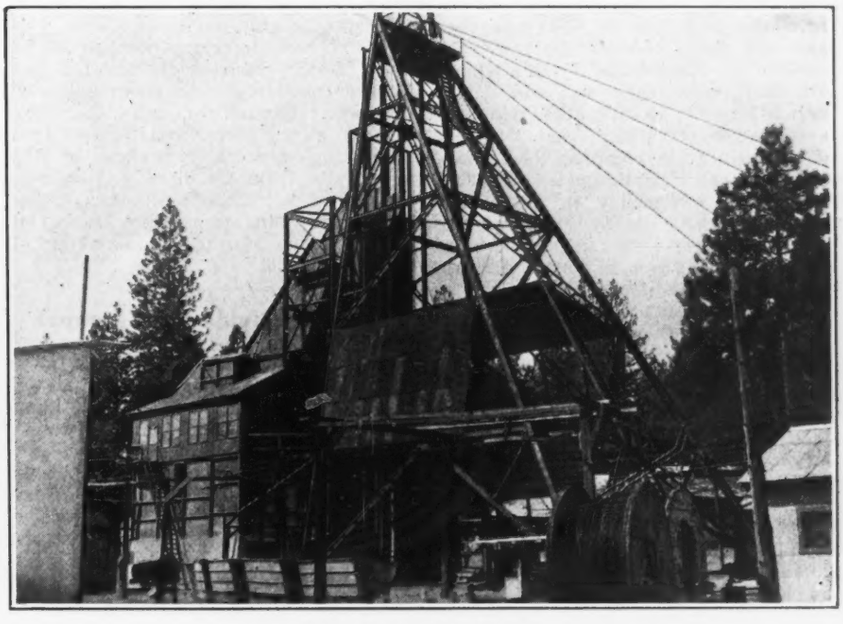
Normandie-Dulmaine

Although the two foregoing enterprises have an important bearing upon future activities in the Nevada City area, the experience of both the North Star and the Empire is worthy of closer study as well. Both of these properties have explored their vein systems to a vertical depth of 3,000 ft. The veins are narrow, and the proportion of advance development and exploration required to insure a steady production of ore is much greater than where veins of greater width are mined. The deepest working in the Champion and Providence is 3,200 ft. on the vein slope, or approximately 1,500 ft. in vertical depth. Other properties in the Nevada City area stopped exploration at depths much less than this. About twenty-four years ago[1] George W. Starr described the Empire mine. At that time the vertical depth was about half what it is now. Mr. Starr stated that in 1879 Grass Valley was known as a worked-out, dying camp. In 1878 the Empire mine was considered to be worked out and too deep for profitable mining. The main incline was 1,200 ft. on the slope and filled with water. A new company took over the property, and by 1883 the mine was brought into another period of prosperity. In the early nineties the mine again became unprofitable. In 1898, Mr. Starr assumed its management and initiated a campaign of development approximating 600 ft. of new work per month. The result of this policy exceeded expectations. Since then the Empire has continued to pay, largely on account of persistent exploration. The North Star mine presents a similar recurrence of rich and poor years.

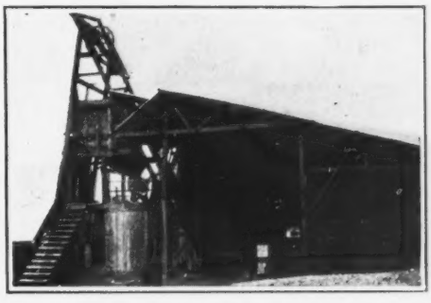
The history of the North Star and Empire mines is significant of the vertical depth to which certain pay zones extend. The Nevada City area presents similar characteristics. Whether deeper development here will be rewarded by the discovery of pay ore can be determined only by shaft sinking, drifting, and crosscutting. The initial conditions that are necessary to undertake such work are experience, good management, and adequate capital. The properties as they stand have only a speculative value. To make them attractive to a mining organization, it is necessary that purchase prices be nominal, to the end that the largest proportion of capital be available for exploration. When W. B. Bourn purchased the North Star in 1884, the price paid was $16,000. The present conditions are different from that time, but dormant mining property cannot be successfully sold for high prices to experienced mining men,

[1] M. & S. P., Vol. 81, pp. 120, 152, 184.

Gold Wedge



Idaho-Maryland mine



The Alcade surface plant

and it is surprising that mining men of experience and good judgment have neglected this district for so long. The success of two large properties in the midst of a district of considerable extent should have tempted others to explore dormant areas. An analysis of past production indicates that four properties, the Empire, North Star, Idaho-Maryland, and Champion-Providence, have produced the major proportion of the gold derived from the district. The availability of many other veins only partly expored therefore holds out special inducements to practical mining men.

Horse Mesa Dam Power Contract Signed

Inspiration Copper Assured of Ample Power by Large Project

The power contract that was recently made by the Inspiration Consolidated Copper Co. and the Salt River Valley Water Users' Association has been approved by both parties. This agreement will make possible the construction of the Horse Mesa dam, which, with the power equipment and transmission lines, it is estimated, will cost more than $4,000,000.

The Inspiration company has guaranteed to use a minimum of $565,000 worth of power each year, or $47,125 per month. The contract is for a period of twenty-five years, and the mining company agrees to pay the minimum amount for fifteen years.

The Water Users' Association is also protected against inability to furnish power in case of dry weather, for it is stipulated that the mining company will pay the minimum even if the power cannot be furnished for that reason. In return, it is agreed that all power of the Horse Mesa project shall be delivered to the Inspiration company, if it is desired. It is estimated that the dam will make available about 500,000 hp. The structure will be about 300 ft. high, 140 ft. wide at the bottom, and 400 ft. wide at the top. If this project is carried to completion, it will be the largest power construction in Arizona since the Roosevelt dam.

The Mormon Flat dam, which is now under construction, will be completed in September. This dam is built for the purpose of making available storage below Roosevelt dam, so that water may be passed through the turbines continuously at the upper dam, furnishing a steady power output, while the water will still be retained in the lower dam for irrigation purposes.

The passage of the bill by Congress appropriating $5,000,000 for the construction of the San Carlos dam, on the Gila River, near San Carlos station, about 65 miles south of Globe, will make possible of development another source of power.

Tennessee Gold Deposit Being Worked

The Annette Mining Co., of Nashville, Tenn., has leased a considerable acreage in the Coker Creek gold field of east Tennessee, and is installing a steam-shovel and log-washing outfit. James L. Akers is general manager.

Bonanza Ore Struck at Las Chispas Mine of the Minas Pedrazzini, Sonora, Mexico

An important strike of bonanza ore has been encountered in a disused section of the 800 level of the Las Chispas mine. The new management installed at the property under the leadership of Morton Webber, believing that the former work in this part of the mine was on a spur vein, decided to prospect for the main vein in this vicinity, with the result that a new drift known as No. 828 picked up what is believed to be the main Las Chispas vein. The drift passed through 20 ft. of ore assaying 15.2 oz. of gold and 1,850 oz. of silver per ton.

As the outcome of this discovery prospecting was started on the 900 level to pick up this oreshoot, which has been accomplished. This was done recently, and careful sampling of the discovery on the 900 level has not been completed, but the car samples average 4 oz. of gold and 500 oz. of silver.

The Diesel-electric power plant of the Minas Pedrazzini erected at Nacozari has now been completed, and has been running for more than two months, giving entire satisfaction. It is understood that the change at the power site from Cananea to Nacozari, decided upon by the new management before the foundations were started at Cananea. has resulted in a saving of about $108,000.

Tonopah Divide and Tonopah Midway May Merge

The Tonopah Divide Mining Co. may absorb the Tonopah Midway Mining Co., by exchange of stock, the stockholders of the Midway to receive one share of Tonopah Divide stock for each seven shares of Midway held by them. The Midway owns five well-situated claims in the Tonopah mining district, and the mine has produced a large tonnage of rich ore from the upper levels. The ore is apparently exhausted on these upper levels, and deeper operations are necessary to prospect for and develop the easterly extensions of the rich veins now being worked in the Tonopah Extension mine, to a depth of at least 2,000 ft.

For several years the Midway company has relied on assessments on stockholders, together with some revenue from limited ore shipments, to finance its operations. The Tonopah Divide company has an ample treasury to finance this deep work properly, so that if the absorption plan is ratified by the Midway stockholders extensive development work will probably be accomplished in a very promising part of the Tonopah district.

Both the Midway and Tonopah Divide companies are controlled by the Brougher interests, so that it is considered likely that the proposed agreement of exchange will be ratified by the Midway company stockholders at the meeting to be held on July 12.

The Tonopah Divide company is developing its gold veins on its Divide property, and a drift from the bottom of a 128 ft. incline shaft, sunk on the vein, shows four feet of $40 ore.

Washington News

By Paul Wooton

Special Correspondent

Department of Commerce to Devote More Attention to Minerals

With the additional appropriations which will become available July 1, it will be possible for the Department of Commerce to expand several of its activities, one of which is its work on the non-ferrous metals. In the organization of its commodity divisions, the Department of Commerce has given preference to the commodities in greatest need of its service. Though considerable work has been done on non-ferrous metals, that activity has not been accentuated as much as will be the policy after July 1. The section is to be reorganized as a division, and will be known as the Minerals Division, since work will be done on other minerals.

In addition to the gathering of information in connection with the non-ferrous ores and manufactured products, the division will concern itself with precious and rare metals and minerals; the non-metallics; cement; asphalt; abrasives; clays; and precious stones.

The work will be under the immediate direction of James A. Stader, who has been chief of the Minerals Section of the Iron and Steel Division. Though a chemist by education, Mr. Stader has first-hand knowledge of the non-ferrous metals, because of the fact that he was born and reared in the Joplin district and has worked in the mining districts of Mexico and other mining regions. He also has first-hand knowledge of European consuming industries through his service with the American Industrial Commission. He served as technical adviser to General Allen during a part of the stay of the American Army on the Rhine, on matters pertaining to Upper Silesia.

An objection put forward to extensive work on the non-ferrous minerals, when the commodity divisions were first organized, was that this trade largely is in the hands of highly organized interests which provide themselves with this type of information. For some time, however, Stephen S. Tuthill, the secretary of the American Zinc Institute, has been pointing out to the department that such a conclusion does not apply to zinc, at least. His efforts have had an important bearing on the determination to expand the department's work.

Iron Cap Assay Office Destroyed by Fire

The assay office of the Iron Cap Copper Co., at Globe, Ariz., was recently burned, and the building, with all equipment, was a total loss. The fire occurred early in the morning, and the blaze was discovered too late for the company's fire department to check it. The loss is estimated to be about $5,000.

London Letter

By W. A. Doman
Special Correspondent

East Rand Proprietary Shares Active—Tin Rises on Speculation—Lonely Reef Near Exhaustion

London, June 10, 1924—Now that political asperities in South Africa are being toned down, the market is once more paying attention to the mining industry. This is the month when dividends are declared, and in anticipation the prices of shares are being moved up. The interesting position, however, is that connected with the East Rand Proprietary Mines. Various rumors circulate as to the reason for the improvement in prices, and they may be given briefly as follows:

1. A plan will in due course be formulated for working the East Rand Proprietary jointly with the Cinderella.
2. Ore of higher gold content is being opened up in some of the lower levels.
3. Working costs are being reduced and the company has been enabled to repay much of its indebtedness.
4. Cynical people are saying that the ore mined is being picked in order that the debentures may be repaid to the holders. It is only natural that the debenture holders should look after their interests, but whether the mine is worked in this manner is, of course, open to question. It seems fairly certain that the debentures have been substantially reduced and that current liabilities for such a large undertaking are not excessive, and certainly speculators are looking forward to a resumption of dividends on the shares. There may be—and probably is—optimism in this attitude, but with the numerous surprises in mining plenty of people seem willing to take the risk, for thousands of shares change hands daily and the price has risen from around about 7s. 6d. to something like 11s. 6d.

The bears of tin, having effected their purpose, are now putting the price up again, and from its recent low level of £201 it has risen to £216 17s. 6d. The making of the price is in the hands of a very few people, and presumably they act to suit their own book. It is not a case of the transaction of a mine selling its production to a buyer, but of making the price nominal on the basis of the law of supply and demand, though it is said that the principal parties are so powerful that this law is not always followed.

Lonely Reef Mine (Rhodesia), which at one time was one of the show properties of the country and in which, before its public flotation, it was said the Rothschilds were interested—possibly because a mining engineer known to have business relations with that great house had reported upon the property—is showing signs of exhaustion, unless, of course, further developments in the deeper levels should open up large quantities of profitable ore. During 1923 the 26th, 27th, and 28th levels were started, but so far have disclosed very little of a profitable nature.

The Ideal Dinner—No Speeches

AN INTERESTING function in connection with the Empire Mining Congress was a dinner given by Hugh F. Marriott, as representative of the Government of the Union of South Africa, to the government delegates of other parts of the Empire, at the Royal Botanical Society's Clubhouse in Regents Park. A feature of the dinner was that no speeches were allowed, the opportunity being taken, as Mr. Marriott said, to enable these experts from all the dominions to get into touch with one another and discuss various problems that might be common to all.

Eagle-Picher Absorbs Lucky Jew

The Eagle-Picher Lead Co. has taken over the Lucky Jew mine, which is situated at the extreme northwestern edge of the Oklahoma-Kansas zinc field. The property was opened in 1919 and has been a fair producer. The Eagle-Picher Co. has been gradually acquiring leases in this area, and now has more than 1,000 acres in all. No purchase price was announced in connection with the Lucky Jew transaction. Since taking charge the Eagle-Picher Co. has changed from steam to electric power at the mine.

A decreasing demand for zinc ore has served to slow down activity in the Joplin-Miami field, but some features are being noted. The American Z. L. & S. Co. has taken an option on a twenty-acre tract formerly known as the Skelton N. 1. It is the first time the American has ever entered the Oklahoma field.

The Indiana Mining Co. has completed and placed in operation a new field shaft. The Quapaw Mining Co. is developing what promises to be an excellent mine on the Davenport lease, three-quarters of a mile north of Quapaw. Ore was struck at 185 ft. and continued down to 215 ft. Heavy water is holding back full development.

The Chanute Spelter Co. reports good drill strikes on its Hartley and Brewster tracts. The Butte-Kansas Mining Co. has let a contract for a 320-ft. shaft on its Acme lease in the Waco field. About fifty drill holes have been put down on this lease in recent months.

Nipissing Leases Aladdin Claims

The Nipissing Mining Co. has taken a lease of the Aladdin property which adjoins some of the Nipissing workings. There is no developed ore on the Aladdin, but Nipissing will carry on an exploration program in an endeavor to locate the extension of some veins.

During May the Nipissing mined ore of an estimated net value of $188.621 and shipped bullion and residues of an estimated net value of $178,439. Silver was estimated at 67c. an ounce. Several small veins were found at No. 64 shaft, and recent work on No. 26 shaft was more favorable than during the preceding month, 3 in. of 600-oz. ore having been found.

Non-Metallic Deposits of Western Canada Being Exploited

Sodium Salts and Fireclays Attracting Attention

Much attention is being attracted by the commercial possibilities of the large deposits of sodium and magnesium compounds, such as sodium chloride, sodium carbonate, and magnesium sulphate, which are found in the prairie country of western Canada.

Solid salts and brines in undrained or partly drained basins are numerous in Saskatchewan. In many places the name "Alkali Lake" has been appropriately applied to deposits of this nature, because in the early spring, and often into late summer, these deposits are covered with water. They vary greatly in size, some being many acres in extent, and ranging up to 15 ft. or more in thickness, with the salts generally found interbedded, or mixed, with calcareous mud and peaty material. In a few instances, the deposits are in a pure enough form to be commercially marketed in their crude state.

Among the deposits which have been investigated by the Federal Bureau of Mines is the deposit known as Frederick Lake, in southern Saskatchewan, which has a hard crystal bed averaging over four feet in depth; Corral Lake, near the western boundary of the province, near the main line of the C. P. R.; Alkali Lake, near Ingebright, 40 miles north of Maple Creek; Fusiler deposit, on the Lacombe-Kerrobert branch of the C. P. R.; the sodium chloride deposit in Senlac Lake, Whiteshore Lake and Muskiki Lake, near Dana, Saskatchewan, where Salts & Chemicals, Ltd., of Kitchener, Ontario, has erected a large plant and is carrying on a large amount of experimentation on the recovery of the sodium sulphate salts in a commercial form.

The Province of Saskatchewan excels in the quality and quantity of the class of raw refractories known as fireclays; and in addition to this valuable material, possesses other argillaceous deposits, from which can be manufactured practically the whole range of structural clay products.

Among the most important of the clay fields in the province is the immense deposit in the Eastern-Ravenscrag district in the Cypress Hills, near the southwest corner of the province. South of these hills the Frenchman River has cut a deep trench in the Tertiary and cretaceous formation, and exposes the valuable refractory and semi-refractory clays which occur at the base of the Tertiary formation. For a distance of about 15 miles the white band clays can be seen outcropping in the valleyside, this band of white clay, from 20 to 50 ft. thick, forming a conspicuous feature of the landscape, resembling in the distance great snowbanks.

Investigations of government experts indicate that the quantity of raw material is practically unlimited. Some of the clays contain small concretions of iron oxide, but these are easily removed by washing, and an abundance of good, clean water can be had from the Frenchman River for washing the clays.

Empire Mining and Metallurgical Congress a Notable Event

Viscount Long Presides—Sessions Continue Four Days, Marked by Interesting Speeches—Attendance of Engineers Good

By W. A. Doman
Joint Editor, *The Financial News*, London, and Correspondent, *Engineering and Mining Journal-Press*

THE INAUGURAL SESSION of the Empire Mining and Metallurgical Congress was held June 3, at the British Empire Exhibition at Wembley, England. There was a large attendance of members of the convening bodies—the Institution of Mining and Metallurgy, the Institution of Mining Engineers, the Institution of Petroleum Technologists, the Mining Association of Great Britain, the Iron and Steel Institute, the Institute of Metals, and the National Federation of Iron & Steel Manufacturers.

Viscount Long of Wraxall, who presided, suggested that it being the anniversary of the King's birthday, a telegram should be sent to His Majesty from the congress, comprising delegates from all parts of the British Empire and specially invited delegates from the United States, offering their congratulations on the occasion. His Majesty, in a reply read later to the congress, wired. "The King has received with much satisfaction the good wishes of the members of the first Empire Mining and Metallurgical Congress on the occasion of his birthday. In thanking them His Majesty is glad to learn that delegates from the United States of America will take part in these discussions, together with representatives from every part of the Empire. The King trusts that all success will attend their deliberations."

Opening Address by Lord Long

Lord Long then delivered an address to the congress on "Mineral Resources and Their Relation to the Prosperity and Development of the Empire." He said that the congress had, for the first time, brought together men from all parts of the British Empire who were devoting their best energies and thought to the development of its mineral resources, and so making a vital contribution to its progress and prosperity. The results of such a meeting as theirs could not fail to be of the most highly beneficial character. The early origins of mining were lost in the shadows of prehistoric antiquity; but they knew that all human progress in those distant times was coincident with and largely based upon those early discoveries in the recovery and treatment of metals. The first miners and metal workers set up a new milestone in the advancement of the race. No nation could become powerful and prosperous without the command of adequate and assured mineral supplies; and, without the great resources of coal and iron with which the British Isles were so richly endowed, Great Britain would have been a much less powerful country than was now the case.

In regard to coal, this might be looked upon as coming first among minerals in importance of influence on national life. From the beginning of the modern era of coal exploitation on a large scale Great Britain had been a leader among producing nations. In fact, for a long time Britain was easily first; but in later years the United States had taken that position, with Great Britain second, and Germany third. The output in the United States overtook the British early in 1905. In 1913 the American yield of coal, including brown coal and lignite, was more than 500,000,000 tons, nearly 40 per cent of the world's total; Great Britain's contribution was 287,430,000 tons, or about 22 per cent, and that of Germany a little more than 20 per cent.

Oil's Importance Increasingly Realized

As regarded oil, the growing importance of this, particularly to the shipping industry, was becoming more and more appreciated. It was unfortunate, the speaker said, that nature had been less prodigal in her gifts of this golden store than of most other mineral products to the British Empire. In relation to world supplies, they possessed within the borders of the Empire a very small percentage of the total, though individually at least three countries, Burma, Trinidad, and Sarawak, could be looked upon as not inconsiderable producers. Of late Canada's yield had slowly been on the down grade, owing to the gradual exhaustion of fields which had been producing for many years. Though today regarded as one of the minor sources of oil, Canada loomed large as an oil country in the early days of oil production on the North American continent, and even today Canadian drillers would be found at work in most of the oil fields of the world. Canada's production today was less than 24,000 tons annually; on the other hand, the yield of natural gas in Canada tended to increase, last year's production of this gas being valued at nearly $6,250,000. It was believed there were possibilities of oil east of the Rocky Mountains and in the Peace River district of British Columbia.

The Empire's Resources in Iron

Turning to iron, the existence of native iron-bearing deposits in conjunction with coal had constituted one of the greatest factors in the industrial prosperity of the British Isles, Lord Long said. The immense engineering industry and the ship-building industry of Great Britain owed their development to the close proximity of the iron ores and ironstone to the coal with which they were worked. The value of the 1922 output of iron ore and ironstone was £2,394,000. Iron-ore deposits existed in Australasia, the actual iron-ore reserves there having been estimated recently to amount to over 344,000,000 tons. Ore had also been found in New Guinea, and extensive deposits existed in many parts of India, in the Malay States, and in Ceylon and Hongkong.

Canada possessed large resources of iron ore, he said, although only a few had been developed, but so far as could be judged the quantity available was estimated as being approximately 300,000,000 tons. Great developments had taken place in steel production in Canada during recent years, especially in Nova Scotia, and the existence of coal there and in British Columbia should encourage prospecting for suitable deposits of iron ore. Newfoundland possessed deposits of almost every known variety of iron ore; indeed, two of the largest mines in the world were situated on Bell Island. The reserves there were estimated at 3,635,000,000 tons.

Empire Leads in Gold and Diamonds

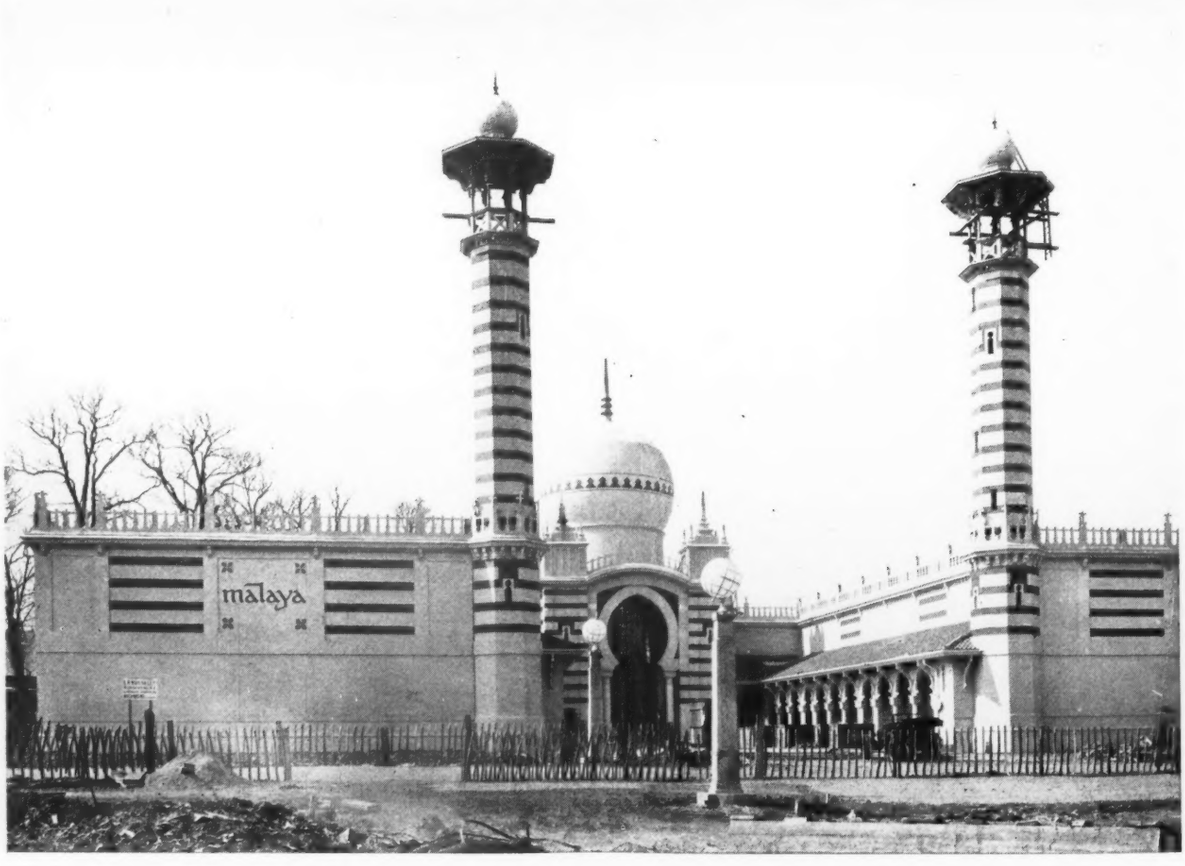
In the production of gold and diamonds the British Empire easily led the world. Of the total gold yield for 1923 of about £54,000,000 the British Empire provided nearly 75 per cent. Of that the Transvaal made the enormous contribution of over 9,143,000 oz. The six greatest gold mines of the world were situated in the British Empire, and of these two on the Witwatersrand had lately been yielding gold to the value of well over £300,000 per month. Until recently the Hollinger mine, in Canada, ranked fourth, with a gross yield of about £250,000 per month. Since the beginning of March last, news had come that still another gold mine had been discovered in northern Ontario, which promised to be very rich. Australia's output of gold was still an important one. Last year, as regarded diamonds, the Union of South Africa alone produced over 2,000,000 metric carats, valued at £6,000,000.

Though holding a relatively lower position as a producer of silver than of gold, the British Empire still occupied an important place among world sources of this other precious metal. In 1918, the Empire produced 40,322,000 fine ounces of silver, or a little more than one-fifth the world's supply, with Canada responsible for approximately 53 per cent of the Empire total. Canada is practically the only part of the British Empire in which silver ores proper are mined as such, but even here a large proportion of the yield, as elsewhere in the Empire, was obtained as a byproduct. With the discovery of the exceptionally rich if somewhat shallow deposits of the Cobalt field, in Ontario, Canadian production of silver rose until, in the years 1912 and 1913, a yield approaching 32,000,000 oz. was

The British Empire Exposition, London

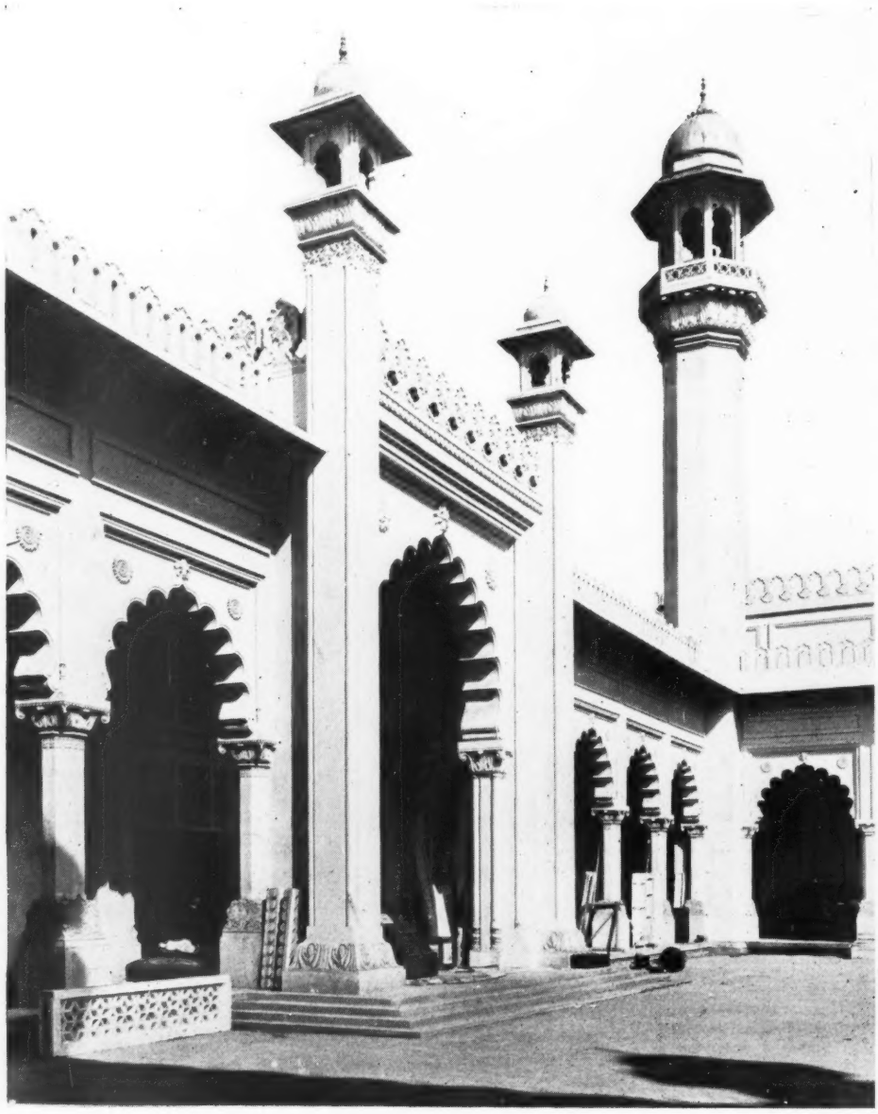
Architectural beauty in many different forms is shown in the design of the buildings that house the great exhibition at Wembley

Above. Canada's pavilion, one of the largest buildings of the Exposition. Below. The Australian pavilion, where the Commonwealth's products are displayed

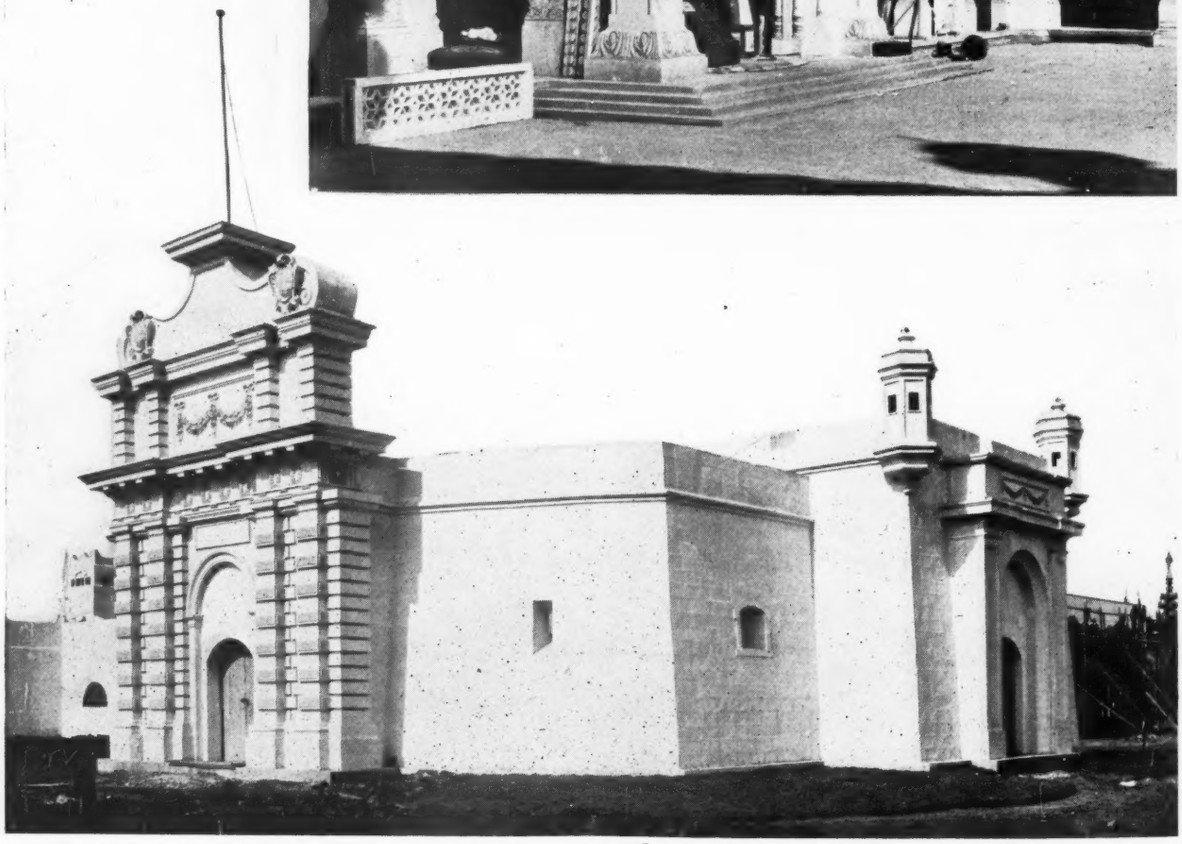


Above. In this Arab palace are exhibited the products of East Africa. Below. A striking edifice houses the Federated Malay States display

Above. In this Civic Hall, Great Britain's towns and cities hold their conferences. Below. New Zealand's pavilion is one of the handsomest



Eastern romance is suggested by the lofty minarets of the Indian pavilion



Malta's exhibit is in a building of beautiful and unique design

secured. As some of these richer Cobalt deposits tended to become exhausted, the yield fell off for 1922 and 1923, but it totaled more than 12,800,000 oz. It was interesting to know that the total silver yield of Cobalt to the end of December last aggregated over 342,000,000 oz., paying dividends totaling £20,000,000 or about one-half of the value of the mineral won. The silver yield from these mines had been supplemented by the recovery of nickel, cobalt, and arsenic.

South Lorrain May Replace Cobalt

There were now indications that the rich Cobalt field may be replaced by the South Lorrain field, on the borders of Lake Temiskaming, which last year turned out about 3,000,000 oz. Several mines in this locality have opened up bonanza ore running from 3,000 oz. to 5,000 oz. per ton. Examination of the area had been made by Edson S. Bastin, professor of economic geology at the University of Chicago, who said that the deposits were likely to extend to considerable depth. Very large quantities of silver had been recovered from the complex ores of the celebrated Broken Hill field, in New South Wales. To the end of 1922, the silver produced in all forms by this state was valued at £79,426,300.

Mining as a Means of Contact

In conclusion, Lord Long said: "Mining will never cease to be a romantic and speculative business, but the more we learn about it, the more we can hope to reduce its uncertainties and difficulties. That is the purpose and hope behind this Empire Mining and Metallurgical Congress. I trust that it will be an effective means of establishing and maintaining contact between the mining men of the various parts of the Empire. Such contact cannot fail to be of great service to them individually, to the mining industry as a whole, and to the great Empire whose interests we all hold at heart.

"To the accomplishment of these great Imperial aids I welcome the gathering together of this assembly; it is surely a proud and inspiring thought that here, in this great hall, are men who have come from all parts of the Empire, and, for the first time in the history of the world, we are able to boast that we, a free people enjoying the maximum of liberty and all the advantages that belong to countries that are governed as ours are, are able to hold a conference like this and to enjoy the knowledge that we have got all these possessions, and that it rests with us to show that we have the courage and the determination necessary to secure full development and all the wealth and prosperity which follow from the proper use of this vast heritage."

Sir John Cadman proposed a vote of thanks to Lord Long for his address. This was seconded by Sir William Ellis and supported by Dr. R. C. Wallace (Canada), Herbert Gepp (Australia and New Zealand), E. S. Dalton (India), and Major Karri Davis (United States).

The proceedings on Wednesday, the second day, were opened by S. Shinwell, Parliamentary Secretary, Mines Department. In welcoming the representatives of the Dominions Mr. Shinwell said that more co-ordination of effort was needed to bind the Empire together. In regard to the purposes for which they were met he hoped that from their deliberations something would emerge that would promote safety in the mines.

Sir John Cadman, presiding at the session of the mining section, said that a telegram had been received from the Prince of Wales replying to a telegram sent to him on the previous day, which read: "I much appreciate the kind telegram I have just received from the delegates and members of the first Empire Mining and Metallurgical Congress, to which, as honorary president, I wish all possible success."

Evan Williams, president of the Mining Association of Great Britain, read a paper on "Economics of the Coal-Mining Industry." In the course of his address he said that in Great Britain wages constituted over 63 per cent of the price of coal at the pit's mouth, and that made it necessary to have frequent variations in wages in order to take account of variations in the prosperity of the industry. He emphasized the vital importance of increased output to the prosperity of the coal industry and the country at large. The eight hours' working day for underground workmen which was in operation prior to 1919 gave an effective working time of only six and one-half hours at the coal face; the reduction of one hour under the Seven Hours Act of 1919 reduced this to five and one-half hours, and, therefore, involved a reduction of 15 or 16 per cent in the effective working time at the coal face.

In the United States today the normal hours of work underground were eight daily (though longer at some mines), and the recent investigations of the United States Commission on the Coal Industry showed that this gave an average daily working time at the face of six hours fifty-four minutes. In Germany the Westphalian mines reverted from the seven- to the eight-hour day some months ago, and in France and in Belgium the eight-hour day is in operation. These comparisons in conjunction with figures given as to the effect of reduced output on costs of production, show how the coal industry in Great Britain is handicapped in meeting the competition of foreign coal, and similarly how its large coal-consuming industries are handicapped in competing with manufactures produced with the aid of foreign coals.

Old Meaning of Safety Lamp Changed

R. V. Wheeler read a paper on "Miners' Safety Lamps." The term "safety lamp," which in former years was synonymous in most people's minds with the Davy lamp, and therefore implied an oil flame protected by gauze, must now be held to embrace that combination of electric battery and miniature incandescent bulb which passes under the general description "miners' electric hand lamp." Although they did not fulfill an important function admirably served by flame-lamps—that of indicating the nature of the atmosphere in which the miner was working—they were in a proper sense "safety" lamps, inasmuch as they afforded a high degree of security against the accidental ignition of an explosive mixture of firedamp and air in which they might chance to be placed.

Should Whitewash Coal Workings

Any scheme of universal lighting, and indeed lighting by hand lamps also, would be greatly aided were the surface to be illuminated white instead of black. It should be possible to do much more than was at present attempted by way of whitewashing underground and any such attempts would be most beneficial to the eyes of the miner. In this connection it may be pointed out that the choice of a white stone dust, such as limestone dust, for treating coal dust, goes a long way toward lightening the roadways.

A Compressor Installation Serving Eleven Plants

The third day's proceedings of the mining section of the congress were presided over by Professor Humphrey M. Morgans. Edmund L. Hann read a paper on "The Rhymney Valley Compressed-air Installation." This installation was one that served a group of eleven collieries, the property of the Powell Duffryn Steam Coal Co., Ltd., and the Rhymney Iron Co., Ltd., situated in the Rhymney Valley, in South Wales.

The position in 1919, when the scheme was under consideration, was that the estimated quantity of compressed air required during the coal-winding shift was about 100,000 cu.ft. per minute. The capacity of the existing compressors, owing to the impossibility of obtaining plant during the war, had become inadequate and was only 50,000 to 55,000 cu.ft. per minute, with practically no spare plant.

After working out detailed figures, the decision was made to put down a central generating plant, utilizing of the existing plant only the electrically driven compressors and adding one or more 6,500 cu.ft. electrically driven compressors at the far ends of the mains. The saving in fuel consumption by replacing the existing steam-driven compressors by either electrically driven compressors or large turbo-compressors was so great that the decision to rely almost entirely upon new plant could be made without much hesitation. At this time a central electric station to have a capacity of 30,000 kw., with steam conditions of 350 lb. per square inch and 750 deg. F. temperature, was in course of construction at Bargoed, so that it appeared to be an obvious step to extend this station by the installation of the necessary turbo-compressors.

Experiments had been made with various types of electrically driven compressors which comprised a horizontal cross-compound slow-speed type driven by a variable-speed direct-coupled direct-current motor and a number of different types of vertical high-speed sets driven by direct-coupled alternating-current induction motors. The most useful size and type was found to be a

Bellis & Morcom two-cylinder vertical compound set having a capacity of 6,500 cu.ft. of free air per minute compressed to 75-80 lb. per square inch.

For the purpose of power-factor improvement, it had been desired to use salient pole synchronous motors for these compressors, but up to this time the general impression of the manufacturers was that this type of motor had not sufficient starting torque to run the compressors up to speed; several synchronous induction motors were installed for various purposes, but experience with these was not altogether satisfactory. Further experiments were therefore carried out to determine accurately the starting torque of the type of compressor last referred to, and it was found that this starting torque need not exceed 33 per cent of the full load torque, which is within the capacity of the modern self-starting salient pole synchronous motors. Two of these were ordered, and having proved satisfactory this type of motor had been standardized. It would be understood that unless constant attention was paid to the underground pipe lengths, serious leakage losses would soon take place, and leakage tests were continually being made at all collieries during week ends, the main valve at the colliery being closed at full pressure and the rate at which the pressure drops charted. Each underground district was then tested in the same way separately, so that leakages can be localized.

It might be assumed that the quantity of compressed air used per ton of coal raised, in a colliery where machine mining was highly developed, amounted to as much as the equivalent of twenty-seven electrical units.

Increased Productivity Need in Coal Mining

Sam Mavor, in the course of his paper on the "Problems of Mechanical Coal Mining," said that the dominating problem in the coal industry was that of reduction in costs of production, and it was a matter of national concern that the industry be conducted on a high plane of efficiency? Labor, being by far the largest factor in the total cost, was the first to attract attention. Labor costs could be reduced by lowering the rates of wages, or by increasing the workers' productivity.

In coal mining increased productivity of labor might be sought in three principal directions: (a) by devising the scheme of operations which involves the minimum amount of "dead work"; (b) by eliminating waste of time due to defects in co-ordination of the various branches of underground work; (c) by so applying manual labor that it shall yield maximum effect in production. In each of these directions it could be shown that machine mining could be a powerful factor.

Advance of British Iron and Steel Industry Reviewed

In the paper on "British Iron and Steel Industry," by F. W. Harbord and E. F. Law, it was pointed out that the introduction of the bessemer process in 1856, followed ten years later by the Siemens or open-hearth process, together with great improvements in blast-furnace practice, made possible the great modern steel industry of the world. The British history of steel making from 1856 to 1870 was really the history of the world's steel industry. Since the introduction of the regenerative stoves in blast-furnace practice, and the bessemer and open-hearth processes, acid and basic, there have been no fundamental inventions which have vitally affected the industry. Great advances had been made during the last forty years in both pig iron and steel manufacture, which have resulted in fuel economy, increased output, and reduced labor costs. The general adoption of closed tops and mechanical charging for blast furnaces, increased temperature, higher pressure, and larger volume of blast and water-cooled boshes, each in themselves of great importance, had, taken together, revolutionized the general practice.

The acid bessemer process, although still holding its own in certain districts, had had, like the basic bessemer, to give way to the open-hearth, and various works had replaced their bessemer converters by open-hearth furnaces, but notwithstanding this about 600,000 tons per annum is still produced by the acid bessemer process.

Previous to the war, the total capacity of British steel works was approximately 9,000,000 tons per annum, but this had now been increased to about 12,000,000 tons, largely due to the fact that the capacity of the basic open-hearth plants had been nearly doubled.

The speaker said that it was realized that in the future, with the development of the iron and steel industries in all parts of the world, British manufacturers would have to face increased competition; that they recognized that many of the colonies and dependencies, as they developed their iron and steel industries, must gradually cease to be customers for many British products, but that they welcomed these developments as evidence of the continuous growth of the great Empire.

Tin Mining in Malay

L. G. Attenborough, in his paper on "Tin Mining in Malay," remarked that the great difficulty in all dredging operations in Malaya was not the digging of the material but its subsequent treatment. In some districts—namely, the Taiping or Larut district, where most of the material was sandy and easily disintegrated—it was easily broken up in the screen, but in this case there was generally a difficulty in getting rid of the large amount of coarse sand over the sluice boxes. Fortunately, the tin also was fairly coarse, and careful boring results made by one of the dredging companies operating there showed that about 92 per cent of the value of the ground proved by boring was recovered by the dredges. The capacity of the dredges, however, was considerably less than it would be in some countries, such as California, where from 40 per cent to 50 per cent of the material treated did not go through the screen and was discarded by the tailing stacker.

In the Kinta district, on the other hand, there was a comparatively large percentage of clay, and this necessitated a much higher pressure of water in the screen to disintegrate as far as possible the clay, which in many instances carries tin ore. Actually, the capacity of a dredge in treating ground in the Kinta Valley is only about three-quarters of what was obtained with a dredge of similar capacity in the Taiping district. In addition, a large percentage of the clay naturally returned to the paddock from the tailing, and unless there was a large supply of fresh water, which was seldom, it concentrated toward the bottom of the paddock with a certain amount of the sand held in suspension. This causes a large amount of wear to the pins and bushes and all other parts under water.

Congress Closes on Fourth Day

The final session of the congress was held on Friday, June 6, under the presidency of Lord Long of Wraxall, who announced that at a meeting of the official delegates held on the previous day, acting on instructions from the councils of their respective institutions, they had constituted themselves an Empire Council of Mining and Metallurgy Institutions, subject to ratification by their respective councils.

Votes of thanks were accorded Lord Long for his presidency of the conference, to the authors of the various papers, and to the secretaries and executive committee. Lord Long, in acknowledging the vote, paid a special tribute to the representatives of the United States who had attended the conference.

Lake Superior Institute Will Visit Marquette Range

The annual meeting of the Lake Superior Mining Institute will be held on the Marquette iron range as originally planned. There was some talk of visiting the Canadian mining fields this year, but as such a trip would take too long a time and only a small percentage of the members could go, it has been decided to adhere to the original program. Marquette is the oldest of the iron ranges. It is the scene of the Ford operations at Iron Mountain and Michigamme, both of which places may be visited. A round of entertainment will be provided for the visitors.

Steel Industry Established, Provo District Celebrates

June 7 was Steel Day at the plant of the Columbia Steel Corporation, at Ironton, Utah, and at the towns of Springville and Provo, between which the plant is situated. The establishment of a new industry was celebrated in this manner. Wiggington E. Creed, president of the Columbia Steel Corporation, and Thomas McKay, of the State Public Utilities Commission, representing Governor Mabey, were the chief speakers. Large crowds attended. A barbecue was given by the company.

Keeley Donates Laboratory

The shareholders of the Keeley Silver Mines, Ltd., at the recent annual meeting made a grant of $4,000 to Queens University, Kingston, Ont., for a mining laboratory for the treatment of Ontario minerals.

Californian Gold Producers Confer at Grass Valley

Discuss Taxation, Sale of Metal, Encouragement of Mining and Formation of State Department of Mines and Minerals

MAINLY for the purpose of formulating a policy to be discussed and voted upon at the convention of the American Mining Congress to be held at Sacramento in September, a joint meeting of the Western Board of Governors and the California Gold Producers was held at Grass Valley, Calif., on June 10. It was attended by about a hundred mining men, mostly from Western states.

Prior to the public sessions, the Board of Governors of the congress, Western Division, named the following to act as a committee to suggest methods for the stabilizing and encouragement of the gold-mining industry: R. E. Tally, Arizona; Emmet D. Boyle, Nevada; George A. Stahl, Colorado, and A. G. Mackenzie, Utah. Subject to the approval of the congress, the following proposals were favored: (1) The creation of a federal department of mines; (2) modification of the laws governing mineral locations; (3) the preservation of timber, under the direction of the Forest Service, in localities where deposits of minerals are known to exist; (4) the devising of ways and means to encourage the investment of capital in the mining industries, and (5) the extension of the Colorado Anti-High-Grade laws to all gold-producing states in the West.

Constructive Comment a Feature

Judge F. P. Nilon presided over the afternoon session. R. E. Tally then spoke of the general problems of the mining industries as a whole and the urgent need for co-operative effort. Mining is a hazardous enterprise, he averred. A mine is a wasting asset, and the continual discovery of new deposits is needed. Steps must be taken to insist on government aid to deflect to the mining industries some, at least, of the capital now being put into tax-exempt securities. The depressing effect of official inaction and discouragement is evidenced by the increasing prejudice against mining by both capital and labor.

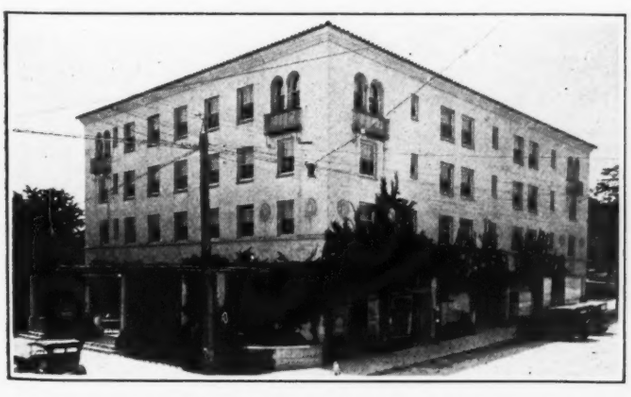
W. J. Loring urged the cessation of the sale of gold by the government to manufacturers for general industrial use and expressed the conviction that an open market would stimulate the industry and help the miner, without in any way affecting the stability of gold as the standard of value. The defacement of gold coins by melting should be prohibited by law, he said, the practicability of legislation to this effect having been demonstrated in Great Britain and in her colonies. Mr. Loring favored the Australian system of establishing state-operated batteries and treatment plants at convenient points, to which the small-mine owner could take ore to be milled at a nominal expense over actual cost of operation. He pleaded for a more wholesome publicity on all matters pertaining to the operation of mines, and favored the compulsory dissemination of information on development and progress. A governmental department of mines should be established in each state, in addition to a federal department. Moreover, the President's Cabinet should include a Secretary of Mines, free from political entanglements.

A. B. Foote, Jr., urged a more careful study of the ultimate effects of the existing methods of taxation, and discussed the real and apparent sources of such revenue. Lloyd L. Root, state mineralogist, presented detailed data and graphs showing the trend of mineral production in California in recent years, with reasons for the appreciations and declines in the three main branches of gold mining—hydraulic, dredge, and deep mining, respectively. George A. Stahl outlined the successful efforts made in Colorado for the encouragement of the prospector.

Emmet D. Boyle, former Governor of Nevada, spoke of the reasons for the failure of the sponsors of the McFadden bill to influence public opinion in its favor. He urged, now that the gold reserve of the country is sufficient for all eventualities, that legislation be introduced prohibiting the melting of gold coin. This would force the establishment of an open market for the gold used in industry. The gold miner, as a seller, is unorganized and unprotected. The user and manufacturer benefits from the advantages that result from co-operative control of his own interests. Under such conditions the miner is at a distinct and unfair disadvantage.

In support of the proposed state department of mines and minerals in California, speeches were made by W. E. Camp, F. Sommer Schmidt, and C. E. Jarvis. The drafting of the necessary legislation would be placed in the hands of competent men. It was pointed out that the destinies of the mining industries of the State of California were influenced by several departments—the Bureau of Mines, the Industrial Accident Commission, the Department of Mine Safety, and the Corporation Commission, the functions of which were not co-ordinated. According to a printed statement distributed at the meeting, the proposed state department would be built around the State Mining Bureau. The Transportation Division would work in co-operation with the state and county highway commissions to remedy any lack of haulage facilities in mining districts. The Power Division would adjust differences between power companies and mine operators, and obtain power extensions. The Metallurgical Division would test new ore-treatment processes and furnish the miner with the results. The Legislative Division would scrutinize all legislation affecting mining and would oppose laws destructive to the industry. The proposed state department, it is averred, would be strictly non-partisan and non-political, in charge of men appointed because of their knowledge of the mining industry, pledged to the development of legitimate mineral enterprise and opposed to fraud.

At the banquet in the evening, at which J. B. Tyrrell acted as toastmaster, Frank H. Probert, dean of the department of mining at the University of California, spoke of the risk of mining and the need for governmental co-operation and help. J. F. Callbreath, who followed, outlined the work of the American Mining Congress and detailed the various legislative achievements that have resulted from its activities in the interests of the mining industries.



Left—A Californian mining town hostelry—headquarters of the conference. Right—Manager's house and grounds, Grass Valley

Men You Should Know About

F. L. Ransome is doing geological work in the vicinity of Butte.

Fred Cowans has resigned as general manager of the Utah Consolidated mine, at Bingham, Utah.

E. F. Burchard is paying a fact-finding visit to the cement plants of the West. He also will visit the iron-ore districts.

F. H. Lahee, chief geologist for the Sun Oil Co., has returned to Dallas, Tex., after a five-months' trip in South America.

A. J. Klamt, who is in charge of the Comstock merger operations on the Comstock, has returned to Virginia City from San Francisco.

W. A. Neill, head of the mechanical engineering department of The Dorr Company, has since June 15 been situated in New York.

B. B. Hood has resigned his position with the Western Electric Co., and has joined the organization of the American Chain Co. as engineer.

F. T. Manley, manager of the refining department of the Texas Company, has returned to his headquarters in Houston, Tex., from a trip in Louisiana.

R. M. Henderson, general manager for the Wellington Mines Co. at Breckenridge, Colo., has been in the Tonopah and Bellehelen districts of Nevada.

A. J. Dunn, editor of the *Wallace Miner* and correspondent for *Mining Journal-Press* at Wallace, was a delegate to the Republican National Convention.

Walter J. Eaton is with the American Smelting & Refining Co., as mine superintendent of that company's Parral Consolidated unit, at Parral, Chihuahua, Mexico.

Olaf P. Jenkins is engaged this summer in a geological examination of the lead deposits of Washington State for the Division of Geology, Department of Conservation and Development.

W. E. Merriss has resigned as secretary of the American Smelting & Refining Co. to take effect Jan. 1, 1925. **George A. Brockington** has been elected secretary to succeed Mr. Merriss.

H. J. Stewart has returned to Montreal from a visit to the Rouyn-Lake Fortune district, northwestern Quebec, and will soon leave for the Hurricanna area, to visit the Laurentian property.

George Armstrong, who this year graduated in science at the University of Toronto, has gone to Peru, having secured a position as metallurgical engineer with the Northern Peru Mining & Smelting Co.

James F. Callbreath, secretary of the American Mining Congress, was in Denver on June 19 and 20, on his return to Washington from the Grass Valley meeting of the Western Division of the congress.

Norman C. Stines has been in Fairbanks, Alaska, and is now en route to Boston. He intends to return in July to Fairbanks, where he is looking after the interests of the U. S. Smelting Co.'s properties.

R. I. Kerr, secretary of the California Metal and Mineral Producers' Association, accompanied by Mrs. Kerr, left San Francisco recently on a trip to Europe. Mr. Kerr expects to return late in August.

H. R. Robbins, formerly professor of mining at Pullman, Wash., is now in Korea, in the interests of the American Cyanamid Co. He expects to go to Formosa and Sado Island before returning to the United States.

H. C. George

H. C. George, geologist and metallurgical engineer, will organize and direct the pioneer school for the training of oil-field engineers which was recently provided for by action of the Board of Regents of the University of Oklahoma. The new school will open in September.

Major R. R. Hogan, of Philadelphia, and associates have purchased the Espanola and Barreteraneo properties, in the State of Nayarit, Mexico, from T. F. Taylor, who has had them under development for some time.

W. B. Boggs, formerly smelter superintendent for the Nichols Copper Co., and later assistant superintendent of the Copper Queen smelter, has accepted the position of general superintendent of the Linndale Reduction Co., Cleveland, Ohio.

Clifford A. Merritt, G. M. Brownell, and **James E. Maynard,** of the University of Manitoba, will assist **Prof. J. S. DeLury** of the Canadian Geological Survey, in investigating the Lake Deschambault area of northeastern Saskatchewan.

George A. Stahl, former president of the Colorado Metal Mining Association and the Colorado representative on the Western Division of the American Mining Congress, has returned to Denver from a meeting of the Western Division at Grass Valley, Calif.

S. B. Davis, mining engineer, who for the last year or more has been giving his attention to oil operations in Wyoming and Montana, has returned to Wallace, Idaho, where he is associated with W. Earl Greenough in the practice of his profession.

D. Bruce Smith, of El Paso, superintendent of the properties of the Ahumada Lead Co. and Erupcion Mining Co. at Los Lamentos, Chihuahua, Mexico, has resigned from his position, but will continue in other work for the Ahumada Lead Co.

G. S. Druhot, topographical engineer in the U. S. Geological Survey, was recently transferred to Denver, where he will have charge of the mapping of 225 square miles of land in the James Peak areas, comprising a tract in Gilpin, Clear Creek, and Grand counties, Colorado.

A. C. Fieldner, superintendent of the Pittsburgh, Pa., experiment station of the U. S. Bureau of Mines, represented the Bureau at the World Power Conference in London. While abroad Mr. Fieldner will make a thorough study of foreign progress in mining and fuel research.

Richard Hamilton, general manager of the Great Boulder Mine, Kalgoorlie, Western Australia, and the doyen of Western Australian mining men, has completed twenty-five years as president of the Chamber of Mines. He was recently the recipient of an illuminated address presented by the members.

J. F. Duthie and **J. R. Turner,** assisting engineer, are making an examination of the work done at the Henderson and Mamie mines since the Federal Mining & Smelting assumed control of the properties and incorporated Duthie Mines, Ltd. After the examination, Messrs. Duthie and Turner will visit the Knauss property, at Doreen, and the Highland Basin property, which Mr. Duthie has under option, and lay out work for the coming season.

H. E. T. Haultain, professor of mining engineering at the University of Toronto, has gone as representative of the university to attend the meeting of the Society for the Promotion of Engineering Education at Boulder, Colo. He will afterward visit the more important mining districts of Colorado, Utah, Idaho, and British Columbia, and on returning east will spend some time in the iron ranges of Minnesota, studying the methods of beneficiation of low-grade iron ores, with a view to their application to the low-grade iron-ore deposits of Ontario.

W. E. Wickenden, of New York, in charge of investigations for the Society for the Promotion of Engineering Education, which is endeavoring to establish a closer relationship between engineering schools and industry, will visit the Michigan copper district sometime this month. In company with **Dr. F. W. McNair,** president of the Michigan College of Mines, at Houghton, a member of the society's board of investigation and co-ordination, he will spend several days at mines, mills and smelters. He also will study the methods of the College of Mines and the relationship of a mining engineering college to the industry. Later he and Dr. McNair will leave for Boulder, Colo., to attend the annual meeting of the society. Mr. Wickenden will go to Europe next fall for a several months' study of methods employed by the foremost engineering colleges.

Recent Technical Publications

Reviews, Abstracts, and References

Economics—Authoritative and Easy to Read

Principles of Economics. By Henry Rogers Seager. Third Edition, revised. Published by Henry Holt & Co., New York. Price $3.

Professor Seager has the best definition of the study of economics I have ever noticed. He declares it to be "the social science which treats of that portion of human activity which is concerned with making a living"—a simple and practical definition. It emphasizes the close connection between economics and every-day business affairs, which is reason enough for the engineer to take an intensive interest in the subject. To those readers who have made no selection of a sound work on economics for a place on their four-foot shelf of books, Professor Seager's volume is recommended. It is written in a style adapted to the business man as well as the student. It gives extended supplementary references to aid the reader in further study on any particular branch of economic thought. Furthermore, the text is up to the minute in its discussion of present-day business problems; over a third of the book treats the practical side of those questions which occupy so much attention from legislators and the community. The tariff, railroads and trusts, tax and monetary systems, socialism and social insurance are but a few of the matters that are given a liberal amount of space in this work on fundamentals. Professor Seager has the happy faculty of making a subject that seems exceedingly dry to many persons, stimulating and absorbing reading. Professional men will profit by a careful study of his book.

F. E. WORMSER.

Portland Cement Prices. Their Basis, Character and Present Position. By Henry Parker Willis and John R. B. Byers. The Ronald Press Co., New York. Price $1.25.

This is a book of fundamental data concerning the portland cement industry, and its interpretation. The authors were asked to prepare it by some of the leading eastern cement manufacturers, who wished to justify the price levels that have obtained for cement in recent years. It must therefore be studied with its origin in mind, though there is reason to believe that the discussion is a fair one. Large users of cement, and miners of the raw material used in its manufacture, will both be interested in such a book devoted to the economics of the industry.

Mechanical Engineers' Handbook. By Lionel S. Marks. Second edition. McGraw-Hill Book Co., New York. Price $6.

The first edition of this book, published in 1916, ran through eleven printings and sold 65,000 copies, so the warm reception accorded to it is evident. Perhaps no branch of engineering is more all embracing that mechanical engineering—mining, chemical, civil, electrical, and the other kinds of real engineers, all must have a knowledge of most of the things that the mechanical engineer feels belong in his particular field primarily. A book such as this containing 2,000 pages of fine but readable type, is of constant use for reference; certainly no one can complain of not getting his money's worth.

A second edition gives the opportunity to correct any errors that may have occurred in the original make-up. Every section has been revised, and considerable new matter added. The subjects that have undergone the most change are Hydraulics, Heat, Iron and Steel, Non-ferrous Metals and Alloys, Bearings, Steam Boilers, Internal Combustion Engines, Aeronautics and Air Compressors; and Drying and Lubrication are given new and extended treatment.

Pulverized Fuel: A Practical Handbook. By W. Francis Goodrich. Charles Griffin & Co., London. J. B. Lippincott Co., Philadelphia, Pa.

This is a small English book which should not be without value to the American reader, for the author has personally investigated the subject of pulverized-coal firing in the United States as well as in other countries besides England. In the first chapter, the history of pulverized fuel is briefly outlined. Then comes a chapter of 74 pages describing the various pulverized-coal systems in use in the United States, followed by one of 61 pages describing the equipment used in Britain and France. Then follows a discussion of the design, equipment, and operation, and a chapter on fuels suitable for use in pulverized form. At the end of the book is a short discussion of the future of this kind of fuel, of which Mr. Goodrich is optimistic. Most of the data covers the use of pulverized fuel for steam boilers.

Practical Calculus for Home Study. By Claude Irwin Palmer. McGraw-Hill Book Co., New York. Price $3.

We venture to say that few mining or metallurgical engineers could solve Problem 1 at the end of the first chapter of this book, which is entitled "Fundamental Ideas." Here it is: "If $y = 10x$ and x_1 is any particular value of x, find Δy when x_1 takes the increment Δx." Unless we are the exception, the fundamentals, to say nothing of the upper reaches of calculus, vanish quickly from the mind of the ordinary engineering graduate. Or, with proper mathematical appreciation, we should no doubt call it "the calculus" instead of omitting the definite article. One of the purposes of Professor Palmer is to make us feel ashamed of ourselves, for, early and often, he points out the practical uses of this mathematical tool and insinuates that we often dig our holes with a dull hoe when a sharp spade is available. Though knowing nothing about the matter, we have sometimes casually referred to dy/dx as though it were a part of our mental equipment, perhaps wishing to impress those who had never sweated over this subject as final examinations approached at college. We must be careful about this in the future, because this book has been so simply written that any one who can read English and is not a moron can master the subject or at least get the gist of what it is all about. Heretofore books on the calculus have been intended for consumption only with liberal amounts of professorial aid. E. H. R.

Powdered Coal—In *Power* for June 3 (McGraw-Hill Co., New York; price 15c.) is the first of a series of articles by A. L. Cole on "Pulverized-fuel Systems." These articles will describe the different types of equipment now in general use for drying, pulverizing, transporting, and burning coal in pulverized form. *Rock Products* (Chicago; price 25c. each issue) has also been running a series of articles by Richard K. Meade, on "Nature, Preparation, and Use of Pulverized Coal."

Mines of Indo-China—"The Mines of Indo-China," 20 pages, an excerpt from an article published by *La Vie Technique & Industrielle*, in English, has been sent us by Direction des Mines de l'Indochine," at Ranoi (Tonkin), Indo-China, from whom further copies may be obtained on request by those interested.

India—The Report of the Chief Inspector of Mines in India, for the year ended Dec. 31, 1922, has recently come to hand. It may be obtained from the Superintendent, Government Printing, Calcutta, India, for 3 rupees.

Patents

Bucket Elevator—No. 1,497,602. June 10, 1924. A. H. Stebbins, Los Angeles. Design for a bucket elevator.

Flotation Reagent — No. 1,497,696. June 17, 1924. R. E. Sayre, New Rochelle, N. Y., assignor to Metals Recovery Co., New York City. The use of a dithiocarbamate as a flotation reagent.

Concentrator—No. 1,497,804. June 17, 1924. Charles Spearman, Westmount, Que., Canada. An apparatus for use in concentrating ores.

Petroleum—No. 1,498,010. June 17, 1924. J. A. Bellman, Henryetta, Okla. A working barrel for an oil pump.

No. 1,489,037. June 17, 1924. C. M. Horton, Electra, Texas. A well-drill fishing tool.

No. 1,498,453. June 17, 1924. B. E. Hudgins, Dallas, Texas. A fire safety valve and control head for oil wells.

No. 1,498,463. June 17, 1924. J. P. McCloskey and H. R. Swan, New York City, assignors to American-Italian Petroleum Co., New York. An oil-well reamer.

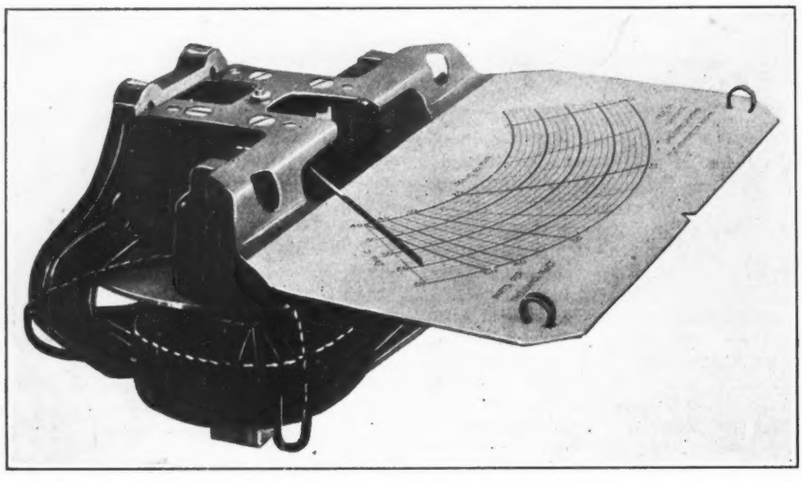
Pulverizer-Separator — No. 1,498,181. June 17, 1924. Lycurgus Lindsay, Los Angeles. A circuit comprising a ball or pebble mill for dry pulverizing, with air separators for separating the fine from the coarse material, the coarse being returned to the mill.

Rock Drill—No. 1,498,452. June 17, 1924. D. J. Hafford, Cleveland, assignor to The Cleveland Rock Drill Co., Cleveland. A hand-fed hammer drill for stoping.

New Machinery and Inventions

A Meter That Measures Salt Concentration in Boilers

Chemical treatment is used extensively to remove impurities from water coming from wells, streams, or lakes for use in boilers. This treatment acts upon the scale-forming elements so that they become highly soluble and are thrown down and blown off in the form of sludge. If the concentration of the chemical salts used to bring about this condition is permitted to increase too much there will be injurious results, such as foaming, priming, or corrosion. To aid the boiler attendant in determining the proper time to correct the solution conditions the concentration meter shown in the accompanying cut has been designed.



The meter-element with case removed. Readings are independent of the supply voltage. The loops on the scale carry a thermometer for indicating the temperature of the solution

On the side of the meter a cup is filled with water drawn from the boiler and the instrument terminals are connected to an A. C. lighting circuit. The scale of the meter shows the concentration of the salts in the boiler directly. If the concentration reading is too high, the operator adds more water or blows down part of the contents. If the concentration is not strong enough, more chemical solution is added. The meter is made by the Esterline-Angus Co., Indianapolis, Ind.

A New Wrench for Either Hand

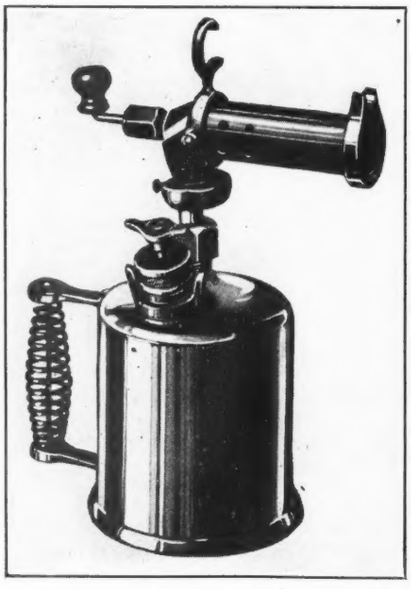
Quick adjustment and a firm grip are two things that one requires above all others when using a wrench. This quick adjustment is secured with the new wrench. A slight pressure of the thumb on the lower jaw instantly sets the wrench to a nut or bolt. It is unnecessary to twist a screw, an operation that usually requires the use of both hands. When the jaw of the wrench is to be released, a slight pressure is exerted on a spring in the handle. In reaching awkward or inaccessible places this wrench will be particularly useful. The wrench is made by the Automatic Wrench Corporation of America, 410 Eleventh St., West New York, N. J.

B. W. Rogers Now With Goodrich Company

B. W. Rogers, who has been identified with the mining department of the Allis-Chalmers Manufacturing Co. for the last five years, and for the last two years has been in charge of the development and sale of ball mills and rod mills for the Allis-Chalmers company, is now with the B. F. Goodrich Co. In his new connection he will be particularly identified with the development and sale of new grinding mill liner for which the Goodrich company has acquired manufacturing rights. This new rubber lining material is known as "Linerite."

This Blow Torch Generates Its Own Pressure

Unlike other types of blow torches, a new one made by the Brookins Manufacturing Co., Dayton, Ohio, generates its own pressure. A specially constructed burner vaporizes the gasoline before it passes into the combustion tube, and this causes the pressure to be maintained automatically without pumping. Enough pressure is established through a few strokes of the pump to start it. Because it weighs only about 2 lb., it can be used without fatigue where a torch must be used continuously.



No pumping is required to keep this blow torch burning

Trade Catalogs

Ball Mills. Bulletin 103 of the Traylor Engineering & Manufacturing Co., Allentown, Pa., describes Traylor wet grinding ball mills. It has 46 pages, with numerous illustrations. A half dozen suggested flowsheets are included.

Rock Drills. The new Waughammer bulletin of the Denver Rock Drill Manufacturing Co., Denver, Colo., is available for free distribution. It covers the Models 93 and 95 of Waughammers. Waugh Turbo drifters, sinkers, stopers, drill sharpener, and steel puncher are covered in a separate 16-page bulletin.

Steel. The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., has issued a 22-page pamphlet entitled "Putting the Right Steel on the Job." It is intended to emphasize the enduring quality of "Tisco" steels and to give publicity to the company's ability to solve steel problems of unusual or difficult nature.

Fans. American Blower Co., Detroit, Mich., describes the constructional features and applications of Ventura disk fans in Bulletin 1,613, which has four pages. Sirocco fans are similarly covered in Bulletin 1,002.

Laboratory Ware. A small 16-page book entitled "Vitreosil Data" is being distributed by the Thermal Syndicate, Ltd., 350 Madison Ave., New York. These data describing the properties of fused pure silica (Vitreosil) are reprinted from the current Chemical Engineering Catalog.

Air Lifts. Methods and apparatus used in Sullivan air-lift pumping systems are discussed at length in an interesting and valuable bulletin, No. 71-H, just issued by the Sullivan Machinery Co., Chicago, Ill. The bulletin is more of a handbook of practice than anything hitherto issued on this subject. Several typical and differing installations are discussed and the improved results secured in each are shown. A considerable variety of installations is also illustrated liberally, showing municipal, industrial, irrigation, and railroad air-lift plants, both at home and overseas. The use of air-lift boosters or re-lift apparatus is also discussed. Instructions for securing well data are given, together with a number of useful engineering tables.

Filters. "Air Filters for Compressors and Internal Combustion Engines" is the title of a 24-page book of data issued by the Midwest Air Filters, Inc., 100 East 45th St., New York. A classification of the different types of compressors is given, together with much other information.

The Market Report

Daily Prices of Metals

June	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
19	12.25	42.125	42.625	7.00	6.85@6.90	5.725@5.75
20	12.25	42.625	43.125	7.00	6.85	5.75
21	12.25	42.375	42.875	7.00	6.80@6.85	5.70 @5.75
23	12.25	43.125	43.625	7.00	6.80	5.725@5.75
24	12.125@12.25	42.625	43.125	7.00	6.75@6.80	5.725@5.75
25	12.125	42.625	43.125	7.00	6.75@6.80	5.725@5.75
Av.	12.219	42.583	43.083	7.00	6.817	5.738

*These prices correspond to the following quotations for copper delivered: June 19th, 20th, 21st and 23d, 12.50c.; 24th, 12.375@12.50c.; 25th, 12.375c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
19	60 7/8	61 3/4	66	217 3/4	217 3/4	31 3/4	29 3/4	31 3/8	31 1/4
20	61	61 7/8	65 1/2	220 1/4	220 1/4	32 1/4	30 1/4	31 1/2	31 3/8
23	61	61 7/8	65 1/2	223	223	32 1/8	29 7/8	31 7/8	31 1/2
24	60 3/4	61 5/8	65	222	221 3/4	32 1/4	29 3/4	31 7/8	31 3/8
25	60 5/8	61 1/2	65	221 7/8	222 1/8	31 3/4	29 3/8	32 1/4	31 1/2

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June	Sterling Exchange "Checks"	Silver		Gold London	June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
19	4.32 1/4	67	34 7/8	95s 5d	23	4.32 5/8	66 3/4	34 5/8	95s 3d
20	4.33 3/4	67 1/8	34 13/16	95s 2d	24	4.31 5/8	66	34 7/16	95s 5d
21	4.33	67	34 3/4	.....	25	4.31 1/4	65 3/4	34 5/16	95s 6d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Prices Decline Slightly in Quiet Trading

New York, June 25, 1924—The volume of metal sales during the last week has continued below the current rate of production, and prices have accordingly weakened to some extent, though no decline of importance has taken place. An encouraging factor has been good foreign buying.

Copper at 12⅜c. Delivered

Beginning with last Thursday, copper was freely offered by practically all producers at 12½c. delivered, for all positions, though some producers were not anxious to book business beyond October. Sales were made in fair volume at that level through Monday, when some tempting business was offered if sellers were willing to take 12⅜c. Only one small lot was reported sold at that level on Monday, whereas as high as 12⅝c. was done in Pittsburgh on that day. Tuesday saw some good business done at both the 12½ and 12⅜c. prices, but today copper is so freely available at 12⅜c. that practically no one is getting any premium over this figure, though most of the largest producers are continuing to quote 12½c. Most of the demand has been for July-August-September. The price is the same for any delivery, but some sellers who have small tonnages of spot available are naturally more anxious to dispose of that. The demand for copper is far from nonexistent, but in the last few weeks it has certainly not been so good as it was earlier in the year, and the statistical report for June will probably show gradually increasing stocks.

The export demand has been very satisfactory as to amount, though competition has kept prices low. Yesterday, 12.30c., f.a.s., could be done, but early today the best bid cabled over was 12.25c. Some producers are finding the foreign demand sufficiently good so that they are not worrying about the extent of their domestic sales.

Copper is now selling at the lowest price it has reached since Sept. 27, 1921.

Lead Weaker With Light Demand

The official contract price of the American Smelting & Refining Co. continues at 7c., New York. The premium which some sellers were able to obtain for a few weeks, particularly on prompt deliveries, has now disappeared, and lead can be obtained for 7c. from practically every producer and for any position. In fact, the demand has been so light that a slight amount has sold as low as 6.975c. and intimations that the 7c. level might be shaded have aroused little enthusiasm on the part of potential buyers. The St. Louis market has weakened relatively more than that in New York, which has been supported by the Smelting company's fixed price. Some of the leading producers continue well sold up and are quoting above the market, but in the last two days lead in quantity more than sufficient to meet the demand has been offered at 6.80c. both in St. Louis and Chicago, and on attractive business sellers have made quotations as low as 6.75c., St. Louis.

Some of the largest users of lead report that business has fallen away materially, the battery makers being especially hard hit owing to the slump in automobile production. They are well supplied with lead and are not likely to be in the market for large tonnages for some time. The immediate future of lead does not look particularly strong.

Zinc Marks Time at 5¾c.

Demand for zinc has been very light all week, but no great pressure to sell at present prices is discernible. The level generally quoted is 5¾c., St. Louis, though on prompt supplies 5.725c. was done in several instances. One weakly held lot was taken up at 5.70c. during the week. Foreign sales have absorbed sufficient zinc to prevent much cutting of prices, the foreign demand for high-grade zinc being especially satisfactory. High-grade continues to sell at 7¾@8¼c. delivered to Eastern points.

No Demand for Tin

Tin prices for the week are almost entirely nominal, there being no demand from consumers, and also no desire to sell by dealers. Forward tin continues at the same price as spot. United States arrivals so far in June total 3,715 long tons.

Foreign Exchanges Steady

There is little change in the principal foreign exchanges. On Tuesday, June 24, closing quotations on francs were 5.29c., and on lire, 4.3225c. Canadian dollars 1⅜ per cent discount.

Silver Declines

The silver market has experienced a severe decline to 65⅞c., caused by the withdrawal of buying orders for account of the Continent, combined with sales in the London market from China and the Indian bazaars. An easier tone in sterling exchange has also contributed to the weakness. Though the general tendency among the principal non-ferrous metals has been downward during the last few weeks, silver, until this week, when a sharp decline is recorded, has moved in an opposite direction. The rise in the price of silver early in June to a new high level since October, 1922, 67⅛c., was due partly to the purchases by Continental consumers. This silver is expected to be coined and placed in circulation by the succession states which are especially anxious to strengthen their financial position and are turning more and more from paper to the use of silver in their currency. The movement is overdue and is expected to continue gathering momentum from other countries. Silver supplies are still available on the Continent, however.

Another factor in the rise of silver prices, and probably the most important, has been the covering of "bear" contracts, which has caused the demand for the metal to increase. The Far East, particularly India and China, has taken the lead in this activity. As usual purchases from Asiatic quarters are depended upon as the chief support of the market.

Mexican Dollars—June 19th, 51⅛c.; 20th, 51⅛c.; 21st, 51⅛c.; 23d, 51⅛c.; 24th, 50⅜c.; 25th, 50⅛c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28@29c. per lb.; 98 per cent, 27@28c. London, £125 per long ton.

Antimony—Per lb.:
Chinese and Japanese brands, 8⅜@8½c.
W. C. C. brand, 11c.
Cookson's "C" grade, 12⅛c.
Chinese needle, lump, nominal, 8½@9c.

Bismuth—$2.35@$2.40 per lb. London, 10s.

Cadmium—60c. per lb. London, 2s. 6d.

Cobalt—$2.50@$3 per lb. for spot.

Iridium—$260@$270 per oz.
Iridium alloyed with platinum, $280@$286.

Nickel—27c. per lb. for 99 per cent virgin metal. London, £135 long ton.

Osmiridium—Crude, $58.50 per oz.

Osmium—$95@$104 per oz.

Palladium—$78@$83 per oz. Crude, $60 per oz.

Platinum:
Refined, $116 per oz.
Crude, $112@$114 per oz.

Quicksilver—$73@$74 per 75-lb. flask. San Francisco wires $71.65; London, £13.

Rhodium—$85@$90 per oz.

Ruthenium—$40@$45 per oz.

The prices of **Magnesium, Molybdenum, Monel Metal, Radium, Selenium, Tellurium, Thallium, and Tungsten** are unchanged from prices given in the June 7 issue.

Metallic Ores

Chrome—$19@$22, depending upon grade and source. Nominal.

Manganese—42@46c. per long ton unit, seaport, c.i.f. Nominal.

Molybdenum—80c. per lb. of MoS_2 for 85 per cent concentrates. Nominal.

Tungsten Ore—Per unit, N. Y.
High-grade wolframite, $9@$9.25.
High-grade scheelite, $9.25.
Ordinary grades, $8.50@$8.75. Nominal.

Iron Ore, Magnetite, Tantalum, and **Vanadium** are unchanged from June 7 quotations.

Zinc and Lead Ore Markets Firm

Joplin, Mo., June 21, 1924 — Zinc blende, per ton, high, $41.40; basis 60 per cent zinc, premium, $40@$41; Prime Western, $39@$40; fines and slimes, $38@$36; average settling price, all grades of blende, $38.68.

Lead, high, $84.55; basis 80 per cent lead, $80; average settling price, all grades of lead, $80.63 per ton.

Shipments for the week: Blende, 11,279; lead, 1,398 tons. Value, all ores the week, $550,060.

All efforts to induce sellers to accept lower offerings were met with a firm refusal, and prices remained unchanged from last week. Mines will individually begin closing down during next week and others will follow for two or three weeks, alternating in a movement to release miners who desire to follow the Kansas wheat harvest.

Platteville, Wis., June 21, 1924 — Blende, basis 60 per cent zinc, $41.50@$42.50 per ton. Lead, basis 80 per cent lead, $85 per ton. Shipments for the week: Blende, 604 tons; lead, 30 tons. Shipments for the year: Blende, 13,343; lead, 492 tons. Shipments for the week to separating plants, 1,162 tons blende.

Non-Metallic Minerals

Borax—Carload lots in bags, per lb. delivered:
Granulated or powdered, 4⅜c.
Crystals, 5c.

Feldspar—Per long ton, *North Carolina:*
No. 1 ground—$15.32@$21.
No. 2 Crude—$4.50@$5.
In *Tennessee*, per short ton:
No. 1 ground—$15.32@$21.
Inferior grades—$11@$16.
Wide range in price caused by differences in quality and fineness of grinding.

Manjak—Barbados, 1 to 5 ton lots:
Grade "A," 6c. per lb.
Grade "AC," 7c. per lb.
Grade "AA," 8c. per lb.
Grade "C," 9c. per lb.
Market active.

Asbestos, Barytes, Bauxite, Beryl, Chalk, China Clay, Diatomaceous Earth, Emery, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Limestone, Magnesite, Mica, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Rutile, Silica, Sulphur, Talc, Tripoli and **Zircon** are unchanged from June 7 prices.

Mineral Products

Arsenious Oxide (white arsenic)—7½@8c. per lb. One or two carloads of spot arsenic were sold during the week, as high as 8¼c. being realized, but several hundred tons for delivery far forward were marketed by two producers in the range quoted.

Copper Sulphate—4.60@4.70c. per lb.

Potassium Sulphate, Sodium Sulphate, Sodium Nitrate and **Zinc Oxide** are unchanged from the June 7 prices.

Ferro-Alloys

Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and **Ferrovanadium** are unchanged from the prices given in the June 7 issue.

Metal Products

Copper — Sheets, 19½c. base; wire, 14⅜c.

Lead Sheets—Cut, 11c.; full, 10⅜c. per lb.

Nickel Silver—18 per cent Grade A sheets, 26½c.

Yellow Metal—Dimension sheets, 17½c.; rods, 14½c.

Zinc Sheets—Base price, $9.50 per 100 lb., f.o.b. plant.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from June 7 prices.

Iron Trade Soft

Pittsburgh, June 24, 1924 — Price competition is not altogether as keen as might be expected from the lean condition of order books. Bars, shapes, and plates in the Pittsburgh market are down $1 a ton, to 2.15c. minimum, 2.20c. being obtained still on ordinary sized orders. There is a little more shading in sheets. Pipe mills continue to hold old prices. Wire products are being shaded only in certain areas, and then by small amounts.

Pig Iron—Basic, quoted at $19, Valley, but this could possibly be shaded. Bessemer is off 50c. to $21, Valley. There has been a fair movement in foundry pig iron in the last three weeks. The buying brought out lower prices, consumption has been under production and more furnaces are going out.

Connellsville Coke—The market has been stagnant. Furnace coke is at $3.25 asked, but this could probably be shaded. Foundry remains at $4.50 to $5, with an easier tone.

Current Prices of Mine Materials and Supplies

RISE AND FALL OF THE MARKET

The downward trend in prices of mine materials and supplies has continued throughout June .Last month a few minor advances were noted but the current market shows no sign of an upward turn. The most notable declines occurred in the following: Steel sheets; structural shapes; track supplies; cast-iron pipe; pine, fir,spruce and hemlock timbers; wire nails; red and white lead and hose.

SHEETS—Quotations are per 100 lb. in various cities from warehouse also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	St. Louis	Chicago	San Francisco	New York
No. 10	$2.80@3.00	$4.10	$4.00	$5.00	$4.14
Black					
No. 28	3.75@3.85	5.00	4.70	5.80	4.75
Galvanized					
No. 28	$4.75@5.00	6.00	5.60	6.50	5.75

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots:

	Pittsburgh Current	Pittsburgh One Year Ago	Birmingham	Chicago
Standard bessemer rails	$43.00	$43.00	$43.00	$43.00
Standard openhearth rails	43.00	43.00	43.00	43.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco	Birmingham
Standard spikes, ⅝-in. and larger	$2.90@3.00	$3.15	$3.00	$3.85	$4.85	$3.70
Track bolts	3.75@4.00	4.25@4.50	4.00	3.90	5.85	4.56
Standard section angle bars	2.75	2.75	2.75	3.45	4.00	3.10

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh and Birmingham together with quotations per 100 lb. from warehouses at places named:

	Pittsburgh, Mill	Birmingham Mill	New York	Dallas	St. Louis	Chicago	San Francisco
Beams, 3 to 15 in.	$2.10@2.25	$3.00	$3.44	$4.20	$3.45	$3.30	$3.60
Channel, 3 to 15 in.	2.10@2.25	3.00	3.44	4.20	3.45	3.30	3.60
Angles, 3 to 6 in., ¼ in. thick	2.10@2.25	3.00	3.44	4.20	3.45	3.30	3.60
Tees, 3 in. and larger	2.10@2.25	2.90	3.44	4.20	3.50	3.30	3.60
Plates	2.10@2.25	3.00	3.44	4.20	3.45	3.30	3.60

WIRE ROPE—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

Hercules red strand, all constructions	20%
Cast steel round strand rope	20%
Galvanized steel rigging and guy rope	7½%
Round strand iron and iron tiller	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%

	New York	Cleveland	Chicago
Drill Rod (from list)	60%	40@55%	50%

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

	Inches	Steel Black	Galv.	Inches	Iron Black	Galv.
BUTT WELD—	..1 to 3	62	50½	1 to 1½	30	13
LAP WELD—	2½ to 6	59	47½	3 to 6	28	13

STEEL PIPE—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
2½ to 6 in. lap welded	44%	47%	46%

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Year Ago	Birmingham	Chicago	St. Louis	San Francisco
6 in. and over	$60.60@61.60	$62.50@63.50	$49.00	$57.20@60.20	$52.60	$59.00

Nuts—	New York	Cleveland	Chicago
Hot pressed, sq., per 100 lb. Off list	$1.50	$4.00	$3.50
Cold punched, sq., per 100 lb. Off list	1.50	4.00	3.50

HOLLOW TILE—Price per block in carload lots to contractor for hollow building tile.

	New York Current on Trucks	New York One Year Ago	Chicago	Philadelphia	St. Louis	San Francisco	Perth Amboy N. J., Factory
4x12x12	$0.1162	$0.1573	$0.064	$0.125	$0.078	$0.108	
6x12x12	.1743	.2097	.088		.106	.156	$0.2786*
8x12x12	.2179	.2621	.12	.215	.14	.244	.3448†

* 10x12x12; † 12x12x12.

MACHINE BOLTS—	New York	Cleveland	Chicago
½ and 1½x3 in. up to 12 in.	15 %	60%	50%

LUMBER—Prices of rough Douglas Fir No. 1 common, in carload lots to dealers in yards at San Francisco. To contractors, $2 per M. ft. additional.

	6-8 and 12 Ft.	10-16-18 and 20 Ft.	22 and 24 Ft.	25 to 32 Ft.
3x3 and 4	$35.00	$36.00	$37.00	$40.00
3x6 and 8	35.00	36.00	37.00	40.00
4x4-6 and 8	35.00	36.00	37.00	40.00

Wholesale prices to dealers of long leaf yellow pine. To contractors in New York City, delivered from lighters or cars to job, $5 additional.

	New York 20 Ft. and Under	New York 22-24 Ft.	Chicago 20 Ft. and Under	Chicago 22-24 Ft.
3x4 to 8x8	$41.00	$42.00	$41.50	$43.50
3x10 to 10x10	46.00	47.00	46.50	48.50
3x12 to 12x12	53.00	54.00	51.50	53.50

Other Cities	8 x8-In. x 20 Ft. and Under Pine	Fir*	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under Pine	Fir*
Boston	$57.50	$66.00†	$50.00	$50.00	$73.50	$88.00†
Cincinnati	40.00	74.00	74.00	88 00	44.00	78.00
Denver	.....	36.75	36.75	36.75	.....	37.75
Minneapolis	40.00	38 75	39.00	.....	43 10	38.75
Kansas City	43.50	48.50	.....	.....	54.50	49.50
Birmingham	24@28	.....	.....	.....	28@32	.....

* Douglas fir. † Prime.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh, Mill	Chicago	San Francisco	Dallas	St. Louis	Montreal
Wire	$2.90@3.00	$3.80	$4.10	$4.55	$3.34	$4.95
Cut	3.00	4.45	5.25	5.75	3.59	5.00

PORTLAND CEMENT—Prices to contractors per bbl. in carload lots *without bags*. Cash discount not deducted.

	Current	One Month Ago	One Year Ago
NewYork, del. by truck	$2.50@2.60	$2.50@2.60	$2.70@2.80
Chicago, f.o.b.	2.20	2.20	2.20
Cleveland, f.o.b.	2.39	2.39	2.46

LIME—Warehouse prices:

	Hydrated, per Ton Finishing	Hydrated, per Ton Common	Lump, per Barrel Finishing	280-lb.net Common
New York	$18.20	$13.10	$3.75	$3.00@$3.25
San Francisco	22.60	.....	....	(180-lb net) 2.10

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl. lots)	$0.98	[illegible]	$0.94	$1.37

WHITE AND RED LEAD—In 100-lb. kegs, base price in cents per pound:

	Dry Current	Dry 1 Yr. Ago	In Oil Current	In Oil 1 Yr. Ago
Red	14.50	14.50	16.00	16.00
White	14.50	14.50	14.50	14.50

HOSE—

Fire Protection — 50-Ft. Lengths.
Underwriters' 2½-in. coupled, single jacket — 56c per ft.

Air—Best Grade
¾-in., per ft. — 3 ply $0.36 — 4 ply $0.44½

Steam—Discounts from List
First grade 30–5% — Second grade 40–5% — Third grade 50%

RUBBER BELTING—The following discounts from list apply to rubber transmission belting:
Best grade 50% — Second grade 50–10%

LEATHER BELTING—List price, 24c. per lin.ft. per inch of width for single ply:

Grade	Discount from list
Medium	40–2½%
Heavy	30–5%

RAWHIDE LACING—For cut, best grade, 45–5%, 2nd grade, 55%. For laces in sides, best, 41c. per sq.ft.; 2nd, 37c. Semi-tanned: cut, 45–5%; sides, 41c. per sq.ft.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam, ½ in.	$0.90
Rubber sheet	.45
Rubber sheet. wire insertion	.70

MANILA ROPE—Per lb., ¾-in. and larger, 1,200-ft. coils.

Atlanta	$0.22	New Orleans	$0.17½
New York	.19½	Seattle	.18
Chicago	.18	San Francisco	.17

EXPLOSIVES—Prices per pound of dynamite in small lots:

	Gelatin 40%	Gelatin 60%
New York	$0.27	$0.295
Minneapolis	.1917	.2123
Denver	.2025	.2275
Seattle	.165	.19
Cincinnati	.2125	.2325
New Orleans	.235	.29
San Francisco	.1625	.1925

FLOTATION OILS—All prices are per gal. in carload lots; 50-gal. bbls., gross weight 500 lbs.

Pine oil, steam dist., f.o.b. New York	$0.60
Pine tar oil, f.o.b. New York	.30

CHEMICALS—

Zinc dust, 550 lb. casks, f.o.b. Palmerton, Pa., per lb.	$0.09½
Litharge, f.o.b. New York, kegs, per 100 lb.	14.50
Sodium cyanide, 220 lb. single case lots, f.o.b. New York, per lb.	.19@.22

Company Reports

Amparo Mining Co.

Gold, Silver; Etzatlan, Jalisco, Mexico

The Amparo Mining Co. earned a net profit of $336,908.27 in 1923. Total tonnage mined and milled during the year was 150,629 metric tons, an average daily run of 413 metric tons, assaying 313 gm. of silver and 6.4 gm. of gold. Average extraction was 92.1 per cent, total silver produced being 1,337,004 oz. and of gold, 30,146 oz. Notwithstanding a smaller tonnage produced, operating costs were reduced 80c. per ton.

Production and Mill Report

Gold and silver bars		$1,151,717.52
Concentrates		157,027.01
Total		$1,308,744.53
Operating expenses		1,014,983.17
Gross profit		$293,761.36
Various credits		30,300.12
		$324,061.48
Depreciation	$35,086.70	
Damages and losses	1,377.10	
Sundries	1,205.55	
Operating net profit		37,669.35
		$286,392.13

Balance Sheet, Dec. 31, 1923

Assets

Plant and land		$2,328,765.20
Available (current)		1,715,035.65
Miscellaneous		571,435.68
		$4,615,236.53

Liabilities

Accounts payable, Mexico	$13,910.69	
Exchange	225.35	
Shipping and selling	10,010.80	
Taxes, Mexico	18,687.23	
Depletion of mining resources	1,039,297.49	
Reserves		
Amparo Mining Co., Mexico	91,934.90	
Mazata Co.	7,152.65	
		$1,936,695.62
Total		$2,678,540.91

Financial Statement

Capital stock	$2,996,800.00	
In treasury	996,800.00	
		$2,000,000.00
Surplus Jan. 1, 1923	$351,717.83	
Add adjustment of contingent fund	352,481.33	
Less interest earned in 1922, credited in 1923	1,670.95	
	$350,810.38	
Less dividends paid	240,000.00	
	$110,810.38	
Net profit, 1923	336,908.27	
	$447,718.65	
Contingent fund	230,822.26	678,540.91
		$2,678,540.91

Royal Development Co.

Silver-Lead-Gold; Washington

A report of the Royal Development Co. for 1923 gives the following balance sheet Dec. 31, 1923:

Assets

Current		$44,481.48
Investments		420,650.00
Mine buildings and construction		14,671.64
Machinery and equipment		28,886.53
Development		278,344.80
Fixed		209,195.41
Total		$996,229.86

Liabilities

Suspense items	$898.86	
Stock subscriptions	6,197.00	
Capital stock		
Common voting (authorized, $500,000) issued and outstanding	$6,022.00	
Common non-voting (authorized $3,500,000) issued and outstanding	208,925.00	
Issued and outstanding (accepted orders)	184,487.00	399,434.00
Royalty certificates—first and second issue		295,000.00
Participating contracts		274,200.00
Reserve		
Unfinished contracts and conditional stock issue		20,500.00
Total liabilities and capital		$996,229.86

Profit-and-Loss Statement

Income		
Interest on bonds and securities	$14,706.73	
Premium on stock sales	2,374.32	
Total income		17,081.05
Total outlay		29,610.07
Excess of outlay over income (capitalized)		$12,529.02

Santa Gertrudis Co., Ltd.

A report of the operations of the Santa Gertrudis Co. for the first quarter of 1924 states that the mill crushed 12,769 dry, short tons of ore from the Santa Gertrudis mine. The value of bullion produced was $96,338 (United States currency). Working expenses (including development, shipping and selling) were $67,777, and the estimated profit at the mines was $28,561.

In addition to the above-noted tonnage, the mill crushed 97,843 dry, short tons of ore, delivered by the Inversiones company from its El Bordo, Malinche, and El Cristo mines, and 23,427 tons from the Dos Carlos company from its Dos Carlos, Refugio & Virginia, and Miniatura mines.

June Mining Dividends Higher Than for Previous Quarter

The following dividends were paid by mining and metallurgical companies during June:

Companies in the United States	Situation	Per Share	Total
American Metal	U. S. and Mex.	$0.75 Q	$402,000
American Metal pfd	U. S. and Mex.	1.75 Q	87,500
American Smelting & Refining pfd	U. S. and Mex.	1.75 Q	875,000
Calumet & Arizona, c	Ariz.	0.50 Q	321,261
Calumet & Hecla Consol. Copper	Mich.	0.50	1,002,751
Eagle-Picher Lead, l.z	Various	1.50 Q	270,000
Federal Mining & Smelting pfd	Idaho	1.75 Q	210,000
Golden Cycle Mng. & Red	Colo.	0.03	45,000
Hecla Mining, s.l	Idaho	0.25 Q	250,000
Homestake Mining, g	S. D.	0.50 M	125,580
Inland Steel	Minn.	0.625Q	629,379
Mother Lode Coalition, c	Alaska	0.375SA	937,500
National Lead	Various	2.00 Q	413,108
National Lead pfd	Various	1.75 Q	426,433
St. Joseph Lead	Mo.	0.50 Q	774,684
Sloss-Sheffield Steel & Iron	Ala.	1.50 Q	150,000
Texas Gulf Sulphur	Texas	1.75 Q	1,111,250
Tamarack & Custer, s. l	Idaho	0.02	100,000
Tintic Standard, s.l.c	Utah	0.25 Q	287,185
U. S. Steel	Various	1.75 Q	8,895,294
United Verde Copper	Ariz.	1.50 Q	450,000
Utah Copper	Utah	1.00 Q	1,624,490
Yellow Pine, s.l.z	Nev.	0.04 Q	40,000
Companies in other countries			
Chile Copper	Chile	0.625Q	2,375,000
Hollinger Consolidated Gold	Ont.	0.05 4 wks.	246,000
Silversmith Mines, s.l.z	B. C.	0.01 Q	25,000
Total			$22,074,415

Q, quarterly; SA, semi-annually; c, copper; l, lead; z, zinc; s, silver; g, gold.

Calamity howlers can find little justification for their attitude, in the June list of mining dividends, the total of which is nearly $2,000,000 greater than for the preceding quarter, paid in March. Calumet & Hecla again paid 50c. a share after omitting the payment that was expected in March. Golden Cycle paid 3c. a share and Tintic Standard increased its dividend to 25c. a share, the largest amount that company has ever paid at one time, and bringing its total dividends to $3,044,352. Tamarack & Custer made its first disbursement since last October. No company passed its dividend, but two reductions were made, that of the Mother Lode Coalition, from 50c. to 37½c., and the United Verde, from $2 to $1.50.

Ontario Mineral Output Increasing

Ontario's Metalliferous Production for the First Quarter, 1923 and 1924

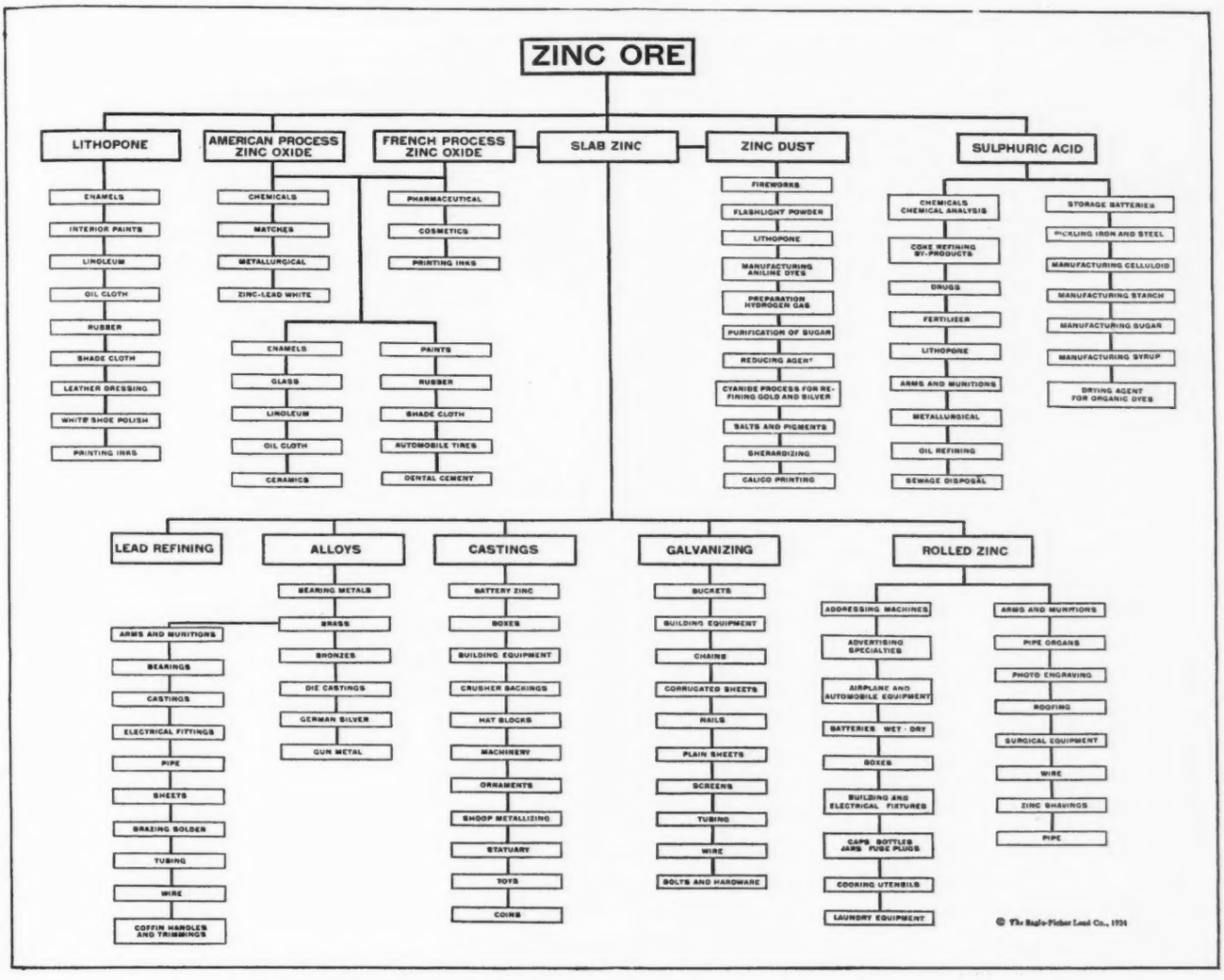
Product	Quantity 1923	Quantity 1924	Value 1923	Value 1924
Gold, oz	213,263	277,369	$4,373,513	$5,735,882
Silver, oz	2,729,749	2,411,332	1,792,876	1,532,694
Platinum metals, oz	20	1,514	1,740	126,782
Copper (metallic) (*a*), lb	2,872,540	4,972,382	460,441	644,483
Copper in matte exported, tons	549	1,371	109,875	219,360
Nickel in matte exported (*a*), tons	1,270	2,189	507,836	656,700
Iron, pig (*b*), tons	.....	3,738	.....	101,174
Cobalt, metallic, lb	84,639	78,020	205,459	176,501
Cobalt oxide, lb	135,923	119,014	268,241	229,704
Nickel oxide, lb	3,140,298	2,349,609	451,213	367,451
Nickel, metallic, lb	4,761,768	7,905,802	927,406	1,614,712
Nickel-cobalt compounds, lb	234,712	93,100	74,186	84,127
Lead, pig, lb	1,003,633	1,114,474	69,067	85,581
Totals	.....	.....	$9,241,853	$11,575,151

(*a*) Copper and nickel valued at 10 cents and 20 cents per pound in 1923, and at 8 cents and 15 cents in 1924 respectively.

(*b*) Total output of pig iron was 159,740 tons, worth $3,896,316. Figures in the table represent proportional product from Ontario ore smelted.

The Market Outlets of Zinc

A Diagram Showing the Many Industries Which Now Consume Zinc and Its Derivatives



The chart reproduced above has been prepared by the staff of the Eagle-Picher Lead Co., and is an interesting graphic picturization of the various products obtained in the smelting of zinc ore and the numerous uses to which they are put.

Radio Industry Requires Much Copper

This Recent Application for the Metal Has Developed Increasing Importance

A survey of the radio industry just completed by the Copper and Brass Research Association discloses that on the basis of an estimated total of 2,500,000 sets in use today, radio apparatus in the United States has consumed 5,000,000 lb. of copper. The survey indicates that the number of radio sets in use will increase to equal the number of automobiles and telephones in the United States (namely, 15,000,000) and that this will likely occur in five years' time. In this event, radio manufacturers would use, in the next five years, 5,000,000 lb. of copper annually.

Copper is an indispensable metal in radio manufacture, either in its basic form or in alloys of brass or bronze. The "average" radio set requires about two pounds of copper in all forms. It is used as coil windings, antennae or loops, lead-in wires and connections, switch-points, switches, binding posts, terminals and other fittings.

The manufacturing of radio apparatus is carried on by both individuals and corporations of all degrees of importance and output, from the lone individual "attic manufacturer" to the largest electrical manufacturing corporation. The real radio fan is continually making and remaking his set, which is reflected in the proportion of sales of parts to finished sets. About 75 per cent of radio sales are for parts, and 25 per cent for finished sets, so that even allowing for replacements to finished sets, the home-made set is numerically much more important.

The radio industry has grown from practically a non-existent status only four years ago to an industry with a sales volume of $115,000,000 in 1923, and the total sales are expected to be over $300,000,000 in 1924. In another two or three years radio sales in the United States will undoubtedly reach the half-billion dollar mark.

Of the various items of radio equipment sales, vacuum tubes amount to a surprisingly large total. Their yearly volume accounts for at least 20 per cent of the entire incandescent lamp sales for all purposes, and over 25 per cent of all sales of radio merchandise.

The total number of broadcasting stations in this country, today is over 550, and five of these are high-power stations whose sending radius is reckoned in thousands of miles.

Mining Stocks

Week Ended June 21, 1924

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Alaska-Br. Col.	N. Y. Curb	...	...	*10	...	...
Anaconda	New York	30⅜	29½	29⅝	De.15, Ja.21, Q	0.75
Arcadian Consol.	Boston	*90	*75	*90	...	...
Ariz. Com'l	Boston	8½	8½	8½	Ja.15, Ja.31	0.50
Calaveras	N. Y. Curb	2⅜	1½	1⅜	...	...
Calumet & Arizona	Boston	44½	44	44	Jn. 6, Ju. 23 Q	0.50
Cal. & Hecla (New)	Boston	14⅞	14½	14⅝	My. 31, Jn. 16	0.50
Canario Copper	N. Y. Curb	3½	2⅜	3⅜	...	...
Cerro de Pasco	New York	46½	44⅜	45⅜	Ap. 17, My. 1	1.00
Chile Copper	New York	28½	27⅜	28	Jn.2, Jn.30, Q	0.62½
Chino	New York	17½	16⅝	17⅛	Sept., 1920,	0.37½
Con. Coppermines	N. Y. Curb	2½	2⅜	2⅜	...	...
Copper Range	Boston	20⅞	19¼	20¼	May, 1923	1.00
Crystal Copper	Boston Curb	*56	*56	*55	...	...
Davis-Daly	Boston	*75	*75	*75	Mar., 1920	0.25
East Butte	Boston	4	4	4	Dec., 1919	0.50
First National	Boston Curb	*32	*25	*32	Feb., 1919,	0.15
Franklin	Boston	†*40	...	...	...	...
Gadsden Copper	Boston Curb	*65	*50	*50	...	...
Granby Consol.	New York	15¼	13½	14⅛	May, 1919	1.25
Greene-Cananea	New York	11½	11⅛	11⅜	Nov., 1920	0.50
Hancock	Boston	†*75	...	...	...	...
Howe Sound	N. Y. Curb	2⅛	2	2	Ap.1, Ap.15, Q	0.05
Inspiration Consol.	New York	23½	23⅛	23⅛	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	2⅝	2⅜	2⅜	May, 1923	0.15
Isle Royale	Boston	12	12	12	Se. 1, Se. 15.	0.50
Jerome Verde Dev.	N. Y. Curb	1	1	1	...	...
Jib Consol.	N. Y. Curb	*52	*40	*47	...	...
Kennecott	New York	39½	37⅛	39½	Jn.6, Jy. 1, Q	0.75
Keweenaw	Boston	*55	*55	*55	...	...
Lake Copper	Boston	1½	1	1	...	...
Magma Copper	New York	27⅛	26⅛	26⅞	Jan., 1919	0.50
Mason Valley	N. Y. Curb	...	...	1½	...	...
Mass Consolidated	Boston	*60	*60	*60	Nov., 1917	1.00
Miami Copper	New York	21	20½	20⅜	My 1. My.15, Q	0.50
Mohawk	Boston	25	23½	25	Se. 22. Oc. 13,	1.00
Mother Lode Con.	New York	7	6⅜	6⅞	Jn.13, Jn.30	0.37½
Nevada Consol.	New York	13	13	13	Sept., 1920,	0.25
New Cornelia	Boston	18½	17¾	18⅛	My.9, My.26,	0.25
New Dominion	N. Y. Curb	...	...	2⅛	...	...
North Butte	Boston	4	3⅜	4	Oct., 1918,	0.25
Ohio Copper	N. Y. Curb	*94	*89	*91	...	...
Old Dominion	Boston	17⅛	17⅛	17⅛	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†105	†100	...	Jn.21, Jy.2 Q	1.00
Quincy	Boston	15	14	15	Mar., 1920	1.00
Ray Consolidated	New York	10½	10	10⅛	Dec., 1920	0.25
Ray Hercules	N. Y. Curb	...	...	*13	...	...
St. Mary's Min. Ld.	Boston	28	26	27⅛	Ap.22, My.20	3.00
Seneca Copper	New York	⅞	¾	⅞	...	...
Shannon	Boston	*35	*30	*30	Nov., 1917	0.25
Shattuck Arizona	New York	...	...	4⅞	Jan., 1920	0.25
Superior & Boston	Boston	*70	*60	*70	...	...
Tenn. C. & C. cfs.	New York	7	6⅜	6⅜	De.31, Ja.15, Q	0.25
Utah Copper	New York	69⅛	68⅛	68⅜	Jn.13, Jn.30,	1.00
Utah Metal & T.	Boston	*20	*14	*20	Dec., 1917	0.30
Victoria	Boston	†*50	...	...	...	...
Walker Mining	N. Y. Curb	...	...	2⅞	...	...
Winona	Boston	*16	*16	*16	...	...
NICKEL-COPPER						
Internat. Nickel	New York	15½	13⅛	15	Mar., 1919	0.50
Internat. Nickel pfd.	New York	83¼	80½	83	Ap.17, My.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	2¼	2	2	...	...
National Lead	New York	147	137½	146¾	Jn.13, Jn.30, Q	2.00
National Lead pfd.	New York	113	113	113	My. 23, Ju. 14, Q	1.75
St. Joseph Lead	New York	26	25⅜	25⅜	Se. 9, Se.20	0.50
ZINC						
Am. Z. L. & S.	New York	8	7⅞	8	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	27	26	26	Nov., 1920	1.50
Butte C. & Z.	New York	4⅛	4⅛	4⅛	Ma., 1923	0.50
Butte & Superior	New York	15⅞	14½	14½	Je.15, Je. 30, Q	0.50
Callahan Zn-Ld.	New York	3⅜	3⅛	3⅜	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	140½	140½	140½	May 10, 1924	2.00
United Zinc	N. Y. Curb	...	...	*25	...	...
Yellow Pine	Los Angeles	71½	67½	67½	June, 1924	0.04
SILVER						
Alvarado	N. Y. Curb	...	...	1	...	...
Beaver Consol.	Toronto	*17⅓	*16½	*17	May, 1920	0.03
Castle-Trethewey	Toronto	*68	*66	*68	...	...
Coniagas	Toronto	1.75	1.75	1.75	Ap.20, My.1	0.02½
Crown Reserve	Toronto	*55	*54½	*55	Jan., 1917	0.05
Keeley	Toronto	2.33	2.32	2.33	...	...
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15, Q	0.12
La Rose	Toronto	*10	*10	*10	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	†1.37	†1.37	1.40	...	...
McKinley-Dar.-Sav.	Toronto	*11	*11	*11	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.80	2.75	2.80	Sept., 1919	0.12½
Nipissing	N. Y. Curb	6½	6	6½	Jn.30, Jy.21, Q	0.15
Ontario Silver	New York	...	...	6½	Jan., 1919	0.50
Temiskaming	Toronto	*21	*21	*21	Jan., 1920	0.40
GOLD						
Alaska Gold	New York	⅛	⅛	⅛	...	...
Alaska Juneau	New York	1¼	1¼	1¼	...	...
Argonaut	Toronto	†*50¾	†*50¾	49½	...	...
Carson Hill	Boston	1¼	1¼	1¼	...	...
Cresson Consol. G.	N. Y. Curb	3¼	3¼	3¼	Mc.3, Ap.10, Q	0.10
Dome Mines	New York	18	17½	17⅝	Jn.26, Jy.21, Q	0.50
Golden Cycle	Colo. Springs	...	...	1.27	My.31, Jn.10 Q	0.03
Hollinger Consol.	Toronto	†13.00	†13.00	13.25	Jn.26, Jy.14, M	0.05
Homestake Mining	New York	43⅜	42½	42½	Jn.20, Jy.25,	0.50
Kirkland Lake	Toronto	*19¾	*19¾	*19¾	...	...
Lake Shore	Toronto	3.70	3.70	3.70	My.2, My.15	0.02
McIntyre-Porcupine	New York	16	15½	15⅝	Ap. 1, My. 1,	0.25
Newray	Toronto	†*28½	†*28½	*30	...	...
Portland	Colo. Springs	...	...	58	Oct., 1920	0.01
Teck-Hughes	Toronto	†1.11	†1.10	1.09	...	...
Tom Reed	Los Angeles	37½	35	37½	Dec., 1919	0.02
Tough-Oakes	Toronto	*63	*62	*62	...	...
United Eastern	N. Y. Curb	*57	*50	*50	Ap 10, Ap.28, Q	0.10
Vipond Cons.	Toronto	†1.04	†1.04	1.06	...	...
Wright-Hargreaves	Toronto	†3.20	†3.20	3.45	Jn.16, Jy. 1, Q	0.02½
GOLD AND SILVER						
Black Oak	N. Y. Curb	*80	*76	*80	...	...
Con. Cortez	N. Y. Curb	*32	*18	*19	...	...
Con. Virginia	San Francisco	4½	4½	4½	...	...
Continental Mines	N. Y. Curb	2¼	2¼	2 3/16	...	...
Dolores Esperanza	N. Y. Curb	...	...	*50	Jy. 1, Jy. 10 Q	0.05
Premier Gold	N. Y. Curb	2¼	1⅞	2	Jn.19, Jy.2	0.08
Tonopah Belmont	N. Y. Curb	*55	*52	*55	Apr., 1923	0.05
Tonopah Divide	N. Y. Curb	*22	*21	*22	Se.22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	2½	2 1/16	2½	Jn. 10, Jy. 1	0.05
Tonopah Mining	N. Y. Curb	...	...	1 1/16	Ap. 6, Ap. 21	0.07½
Unity Gold	N. Y. Curb	1	*75	*90	...	...
West End Consol.	N. Y. Curb	*35	*30	*35	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*51	*50	*50	June, 1918	0.02
SILVER-LEAD						
Ahumada	Boston Curb	6	5⅛	5⅛	Jn.16, Jy. 2, X	0.15
Bingham Mines	Boston	†14	...	...	Sept., 1919	0.25
Cardiff M. & M.	Salt Lake	*85	*85	*85	Dec., 1920	0.15
Chief Consol.	Boston Curb	3⅛	2⅞	3	Ap 19, My.1, Q	0.10
Columbus Rexall	Salt Lake	20	16	17½	Aug., 1922	0.03
Consol. M. & S.	Montreal	38½	36	38	Jn.30, Jy.15	0.75
Daly Mining	Salt Lake	...	...	205	July, 1920	0.10
Erupcion	Boston Curb	2⅛	2⅛	2⅛	Jn. 16, Jy.2, X	0.15
Federal M. & S.	New York	10½	9	10¼	Jan., 1909	1.50
Federal M. & S. pfd.	New York	46⅜	43⅜	45⅜	My.26, Jn.15, Q.	1.75
Florence Silver	Spokane	10⅜	10	10⅛	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	9⅛	8⅞	8⅛	My.15, Jn.15,	0.25
Iron Blossom Con.	N. Y. Curb	...	...	*26	Oct., 1923	0.02
Marsh Mines	N. Y. Curb	*7	*7	*7	June, 1921	0.02½
Park City	Salt Lake	....	....	4.00	Jn.14, Jy.1,	0.15
Park Utah	N. Y. Curb	...	...	3½	Mc.15, Ap.1	0.15
Prince Consol.	Salt Lake	*8½	*8	*8½	Nov., 1917	0.02
Silver King	N. Y. Curb	...	...	*60	Jn.20, Jy.1, Q	0.15
Silversmith	Spokane	*35	*34	*35	Jn.1, Jn. 10,	0.01
Tamarack-Custer	Spokane	1.55	1.50	1.50	Jn.25, Jn.30,	0.02
Tintic Standard	Salt Lake	4.55	4.50	4.55	Jy.28, '24, X	0.25
Utah-Apex	Boston	2¼	2¼	2¼	June, 1923,	0.50
IRON						
Bethlehem Steel	New York	47⅛	45¾	47	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit	....	....	½	...	...
Char. Iron pfd.	Detroit	...	...	1	...	...
Colorado Fuel & Iron	New York	46¼	41¼	44½	My.10, My.26 Q	2.00
Col. Fuel & Iron pfd.	New York	...	...	102	Feb., 1923	2.00
Gt. North'n Iron Ore	New York	27	26⅛	27	De.10, De.27	2.00
Inland Steel	N. Y. Curb	....	....	46	My.15, Jn.1 Q	0.62½
Mesabi Iron	N. Y. Curb	....	....	2⅜	...	...
Replogle Steel	New York	8	7½	7⅞	...	...
Republic I. & S.	New York	45⅞	44⅜	45⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	83½	82	83½	Jn.14, Jy.1, Q	1.75
Sloss-Sheffield S.&I.	New York	55½	54½	55	Jn.6, Jn.20, Q	1.50
Sloss-Shef. S &I.pfd.	New York	...	...	82	Jn.18, Jy.2, Q	1.75
U. S. Steel	New York	97¼	96⅜	97	Jn.1, Jn.28 QX	1.75
U. S. Steel pfd.	New York	122½	120½	121⅜	My.6, My.29, Q	1.75
Virginia I. C. & C.	New York	38	38	38	De.15, Ja. 2	1.50
Virginia I.C.&C.pfd.	New York	...	...	76	Jn.17, Jy.1	2.50
VANADIUM						
Vanadium Corp.	New York	22	21¼	21½	Jan., 1921	1.00
ARSENIC						
Western Utah Copper	N. Y. Curb	*28	*25	*25	...	...
ASBESTOS						
Asbestos Corp.	Montreal	22	19	19	Se.29, Oc.15 Q	1.00
Asbestos Corp. pfd.	Montreal	57	55	57	Jy.1, Jy.16, Q	1.50
SULPHUR						
Freeport Texas	New York	9½	8⅞	8⅞	Nov., 1919,	1.00
Texas Gulf	New York	65⅛	63	65	My.31, Jn.14 QX	1.75
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	3	3	3	...	...
MINING, SMELTING AND REFINING						
Amer. Metal	New York	40⅛	40	40	My.20, Jn.1, Q	0.75
Amer. Metal pfd.	New York	110⅛	110⅛	110⅛	My.20, Jn.1, Q	1.75
Amer. Sm. & Ref.	New York	65⅛	62⅛	64⅛	Jy.11, Au. 1, Q	1.25
Amer.Sm.&Ref.pfd.	New York	100⅛	100	100	Au. 8, Se. 1,	1.75
U. S. Sm. R. & M.	New York	21	20⅛	20⅛	Jan., 1921,	0.50
U.S. Sm. R.&M.pfd.	New York	39⅜	38½	39⅜	Apr., 1924, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

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Volume 117 June 28, 1924 *Number* 26

ENGINEERING AND MINING JOURNAL-PRESS

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883 Mission St., San Francisco, Calif. Colorado Building, Washington, D. C.

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Cable Address: "Machinist, N. Y."
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Publishers of
Engineering News-Record American Machinist
Power Chemical and Metallurgical Engineering
Coal Age Engineering and Mining Journal-Press
Ingeniería Internacional
Electrical World Electrical Merchandising
Bus Transportation Electric Railway Journal
Journal of Electricity and Western Industry
(Published in San Francisco)
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Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

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Change of Address—When change of address is ordered the new and the old address must be given. Notice must be received at New York at least ten days before the change takes place.
Published weekly. Entered as second-class matter June 20, 1879, at the Post Office at New York under the Act of March 3, 1879.
Printed in U. S. A.
Member Audit Bureau of Circulations.
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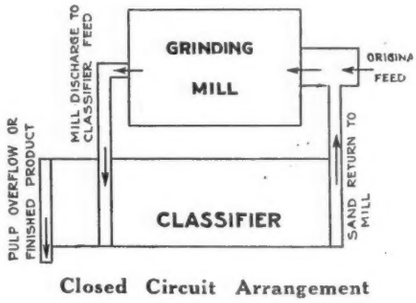
A Word About Grinding

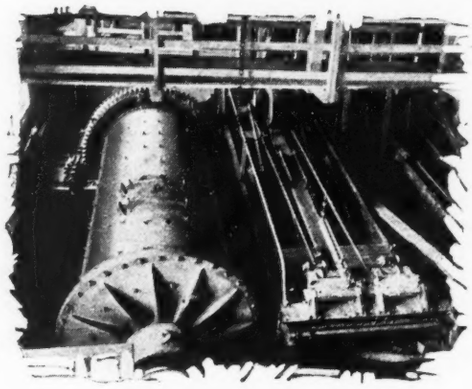
ARE you grinding wet? That is the modern tendency wherever the process permits. It is more economical and convenient than the dry method and incidental classification and control are simpler and less expensive.

The efficacy of wet grinding is greatly increased, often 300%, by the closed circuit arrangement shown, whereby a Dorr Classifier separates the sufficiently ground portion of the product from the over-size and sends the latter back for another pass through the mill. Reasons for this increase are obvious, viz.:

1. To reduce all the material to a given size in a single pass, a large amount of work is expended in overgrinding a considerable portion. In closed circuit grinding, all the work is effective.



Closed Circuit Arrangement



Dorr classifier in closed circuit with a tube mill.

2. When all material is reduced in one pass, the mill must be fed more slowly. Therefore, it cannot be kept full, and the balls, rods, or pebbles spend much of the time grinding themselves without working on the material. With the closed circuit arrangement, the mill can be kept fully charged all the time.
3. Fine material tends to fill voids, has a cushioning effect and thus slows up grinding. The Dorr Classifier removes the fines as soon as formed.

With the capacity of each mill so greatly increased, the number of mills needed is proportionately reduced, with corresponding savings in first cost, power, repairs, labor, etc. In addition to this, The Dorr Classifier protects the system from oversize and sends a uniform product to the subsequent process.

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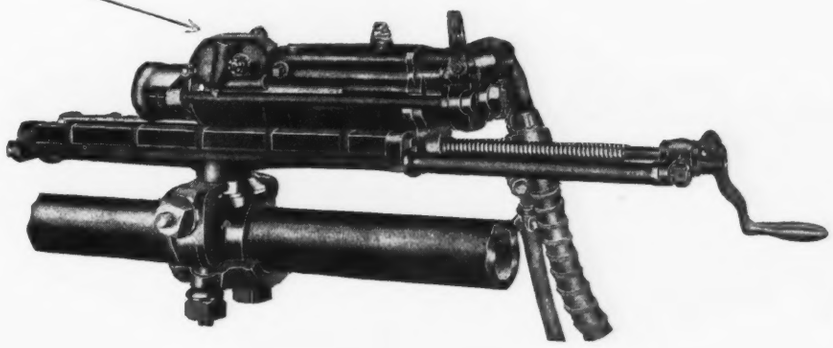
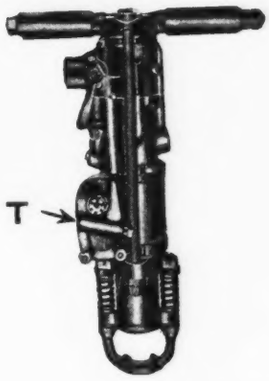


The small air turbine which rotates the drill steel independently from the hammer action is shown at T. To the right, Model 31, below Model 37.

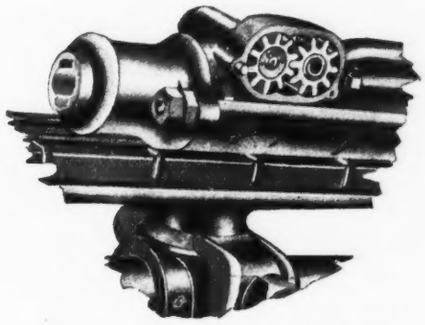


Rotation
on Turbro Drills

Independent rotation of drill steel, distinct from the hammer action, gives rock drills more power and flexibility, increases their drilling speed, and eliminates all danger of "stuck steel" and "lost holes."

Waugh Turbro drifters and Turbro Waughammers use a small air turbine, as shown in the picture, for rotating the drill steel. The air turbine works through a worm and worm gear reduction, the most efficient means of transmitting power, which gives these drills a powerful, positive rotation.

Increased hourly drill footage, ease of operation, and independent rotation are some of the features of these drills.



Close up view of the rotating mechanism indicated by "T."

Model 31 Turbro drifter for general mine work. Weight 146 lbs.

Model 34 Turbro drifter for extremely heavy work and for the jobs that seem impossible. Weight 225 lbs.

Model 37 Turbro Waughammer for sinking in difficult ground and where great drilling speed is required. Weight 65 lbs.

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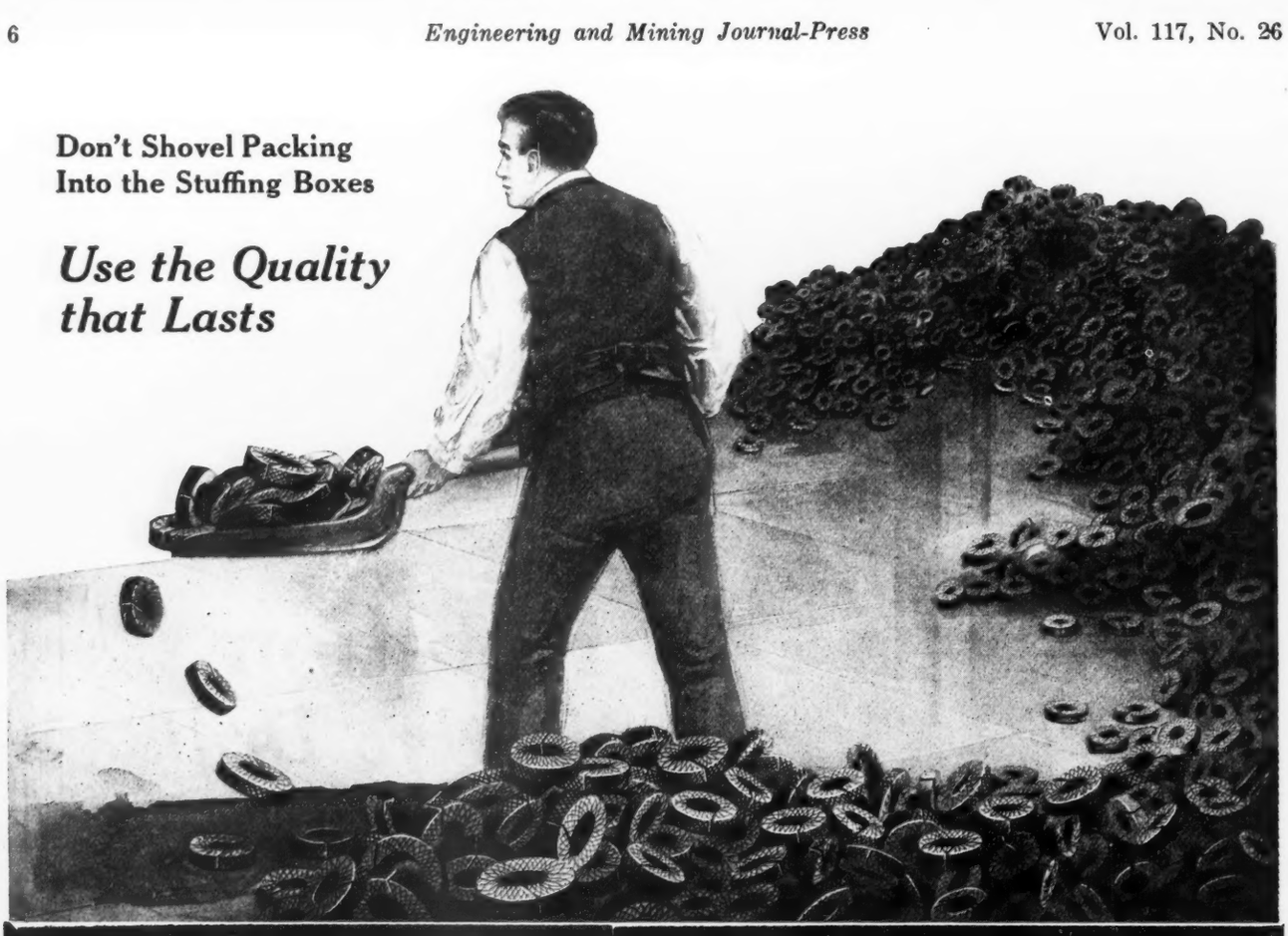

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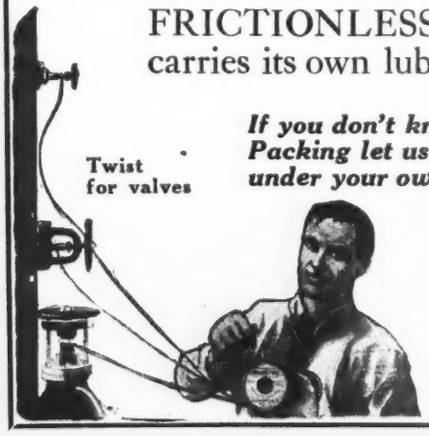
is made to give long service, even under the hard conditions of high pressure, superheated steam, and compressed air.

FRICTIONLESS, as each single strand of "Palmetto" carries its own lubricant.



Twist for valves

If you don't know the lasting qualities of "Palmetto" Packing let us send you free working samples to test under your own conditions.

Braided for rods

GREENE, TWEED & CO.

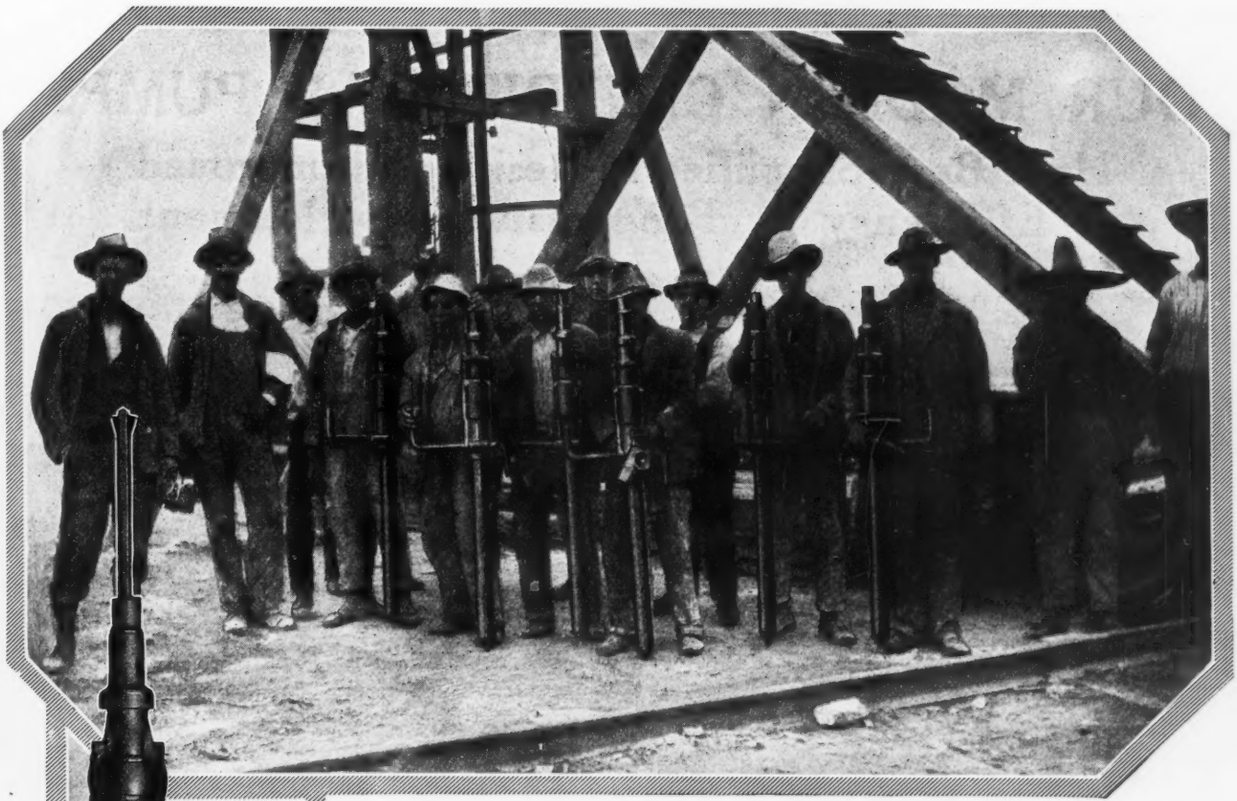
Sole Manufacturers

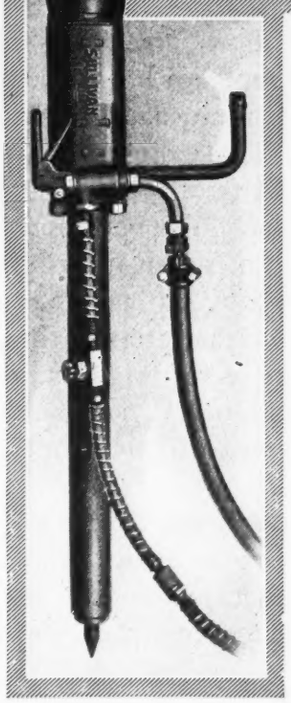
109 Duane St., New York

W. F. Johnson & Co.

General Agents

113 Clerkenwell Road, London, E. C.





A Proven Water Stoper

More and more mining districts are calling for water stopers, drills that will prevent sharp dust and cuttings from finding their way into the miners' lungs.

SULLIVAN WATER STOPERS

have shown their practical value by years of service in numerous camps from Butte to Mexico. They discharge their water jet through the steel at the back of the hole, preventing the dust from forming.

Leakage is avoided by Sullivan water inlet and water tube design.

Sullivan automatic rotation, and one hand throttle control of drilling and feed, render this stoper so simple and easy to handle that unskilled labor, can operate it effectively.

The drill is the "DT-421". It weighs 96 lbs. It is a Sullivan drill product, machined from alloy steel drop forged billets and bars, heat treated and with working parts ground to fit. Laboratory and field tests insure its performance in your mine.

A hand-rotated water stoper (DT-44) is also available.

Ask for Stoper Bulletin No. 270-Y

DOMESTIC SALES OFFICES

Birmingham, Boston, Butte, Claremont, N. H., Cleveland, Dallas, Denver, Duluth, El Paso, Huntington, W. Va., Joplin, Juneau, Knoxville, New York, Pittsburgh, St. Louis, Salt Lake, San Francisco Spokane.

COMPRESSORS AIR LIFT DIAMOND DRILLS SHARPENERS FORGES
FORGE HAMMERS COAL CUTTERS ROCK DRILLS DRILLING CONTRACTORS

SULLIVAN TRADE MARK
MACHINERY COMPANY
126 So. Michigan Ave. Chicago.

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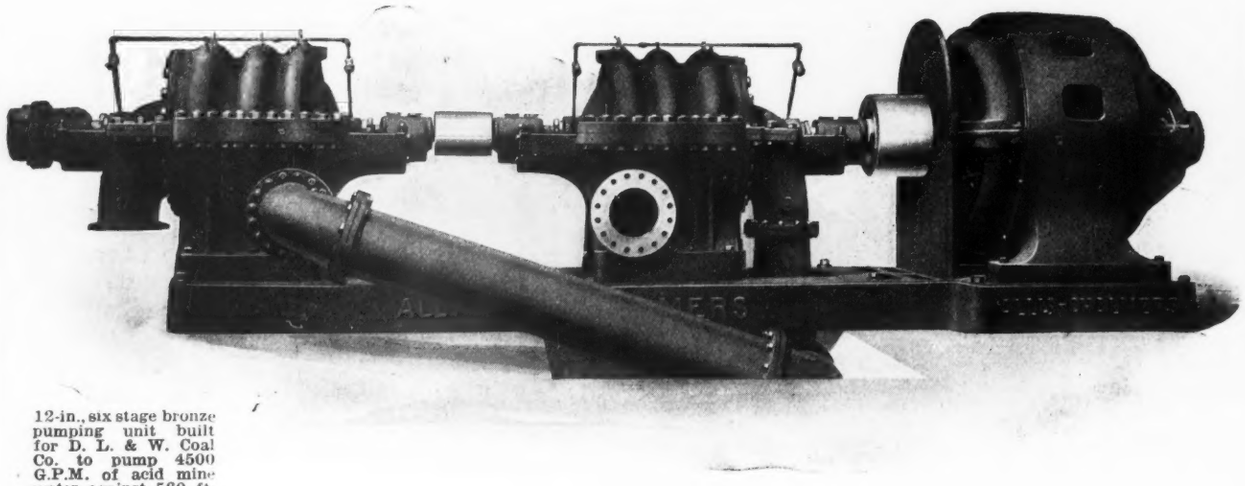
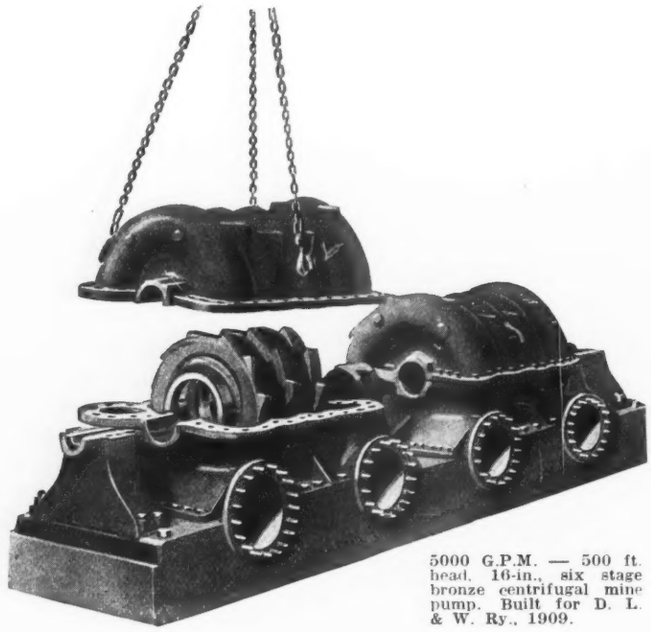
Algiers, Brussels, Calcutta, Christiania, Durban, Natal, Havana, Lima, London, Madrid, Mexico City, Paris, San Juan, Santiago, Shanghai, Sydney, N. S. W., Tokyo, Toronto, Tunis, Turin, Vancouver

OUR MODERN CENTRIFUGAL PUMPS

Have Been Simplified in Design and Improved in Efficiency by Progressive Development



12-in., six stage bronze pumping unit built for D. L. & W. Coal Co. to pump 4500 G.P.M. of acid mine water against 560 ft. head.



5000 G.P.M. — 500 ft. head. 16-in., six stage bronze centrifugal mine pump. Built for D. L. & W. Ry., 1909.

The pump shown below is a pioneer installation of bronze centrifugal mine pump and the first of over 160,000,000 gallons per day pumping capacity of bronze mine pumps installed. The unit shown above is a recent pump furnished the same company, as bought the first one. At the present time there are many of the largest mining and industrial companies which have used Allis-Chalmers Centrifugal Pumps for years and are well satisfied with them and our engineering assistance which has helped them select the best units for their requirements.

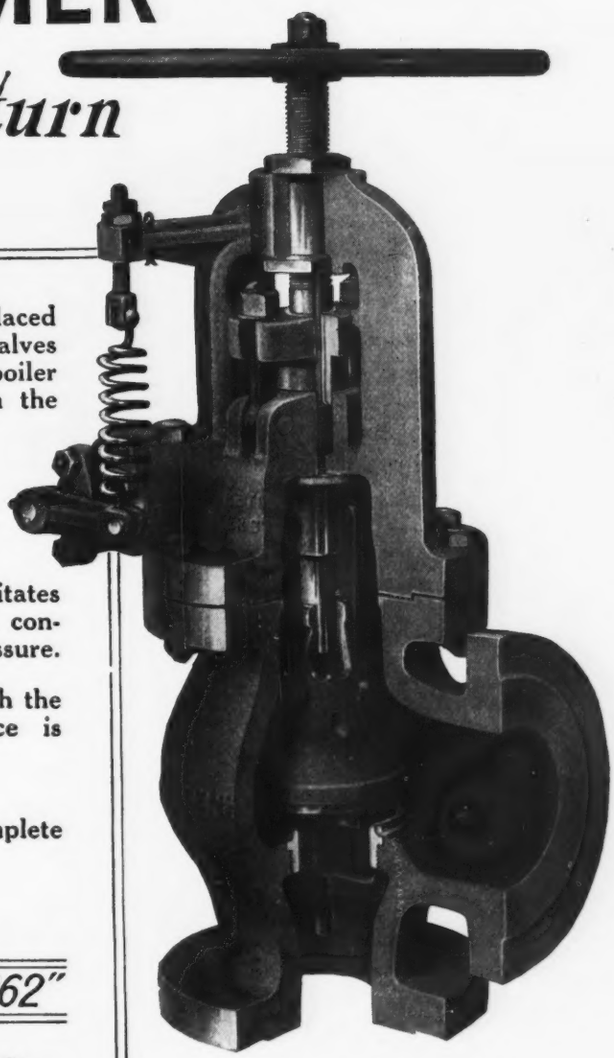
Our engineers will apply their experience to your pumping problems on request.

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

LUNKENHEIMER

Safety Non-Return Valves



Positive dependence can be placed upon the prompt closing of these Valves should the pressure within the boiler suddenly drop below that in the header.

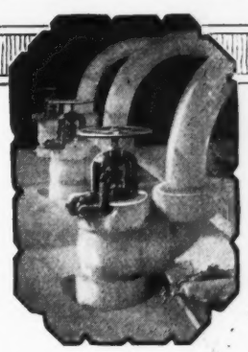
There being no internal dash pot, the disc is free in action and does not stick or bind. Chattering is eliminated by the outside spring mechanism which facilitates instant adjustment to meet any condition while the valve is under pressure.

Efficient prolonged service with the utmost economy of maintenance is assured.

Booklet **525 BK** contains complete information. Write for a copy.

"America's Best since 1862"

THE LUNKENHEIMER CO.
"QUALITY"
LARGEST MANUFACTURERS OF HIGH GRADE ENGINEERING SPECIALTIES IN THE WORLD
NEW YORK CHICAGO CINCINNATI, U.S.A. BOSTON LONDON
EXPORT DEPT. 129-135 LAFAYETTE ST., NEW YORK



Essential for the safe operation of boilers connected in battery

10-23-20

TELSMITH RE-CRUSHER

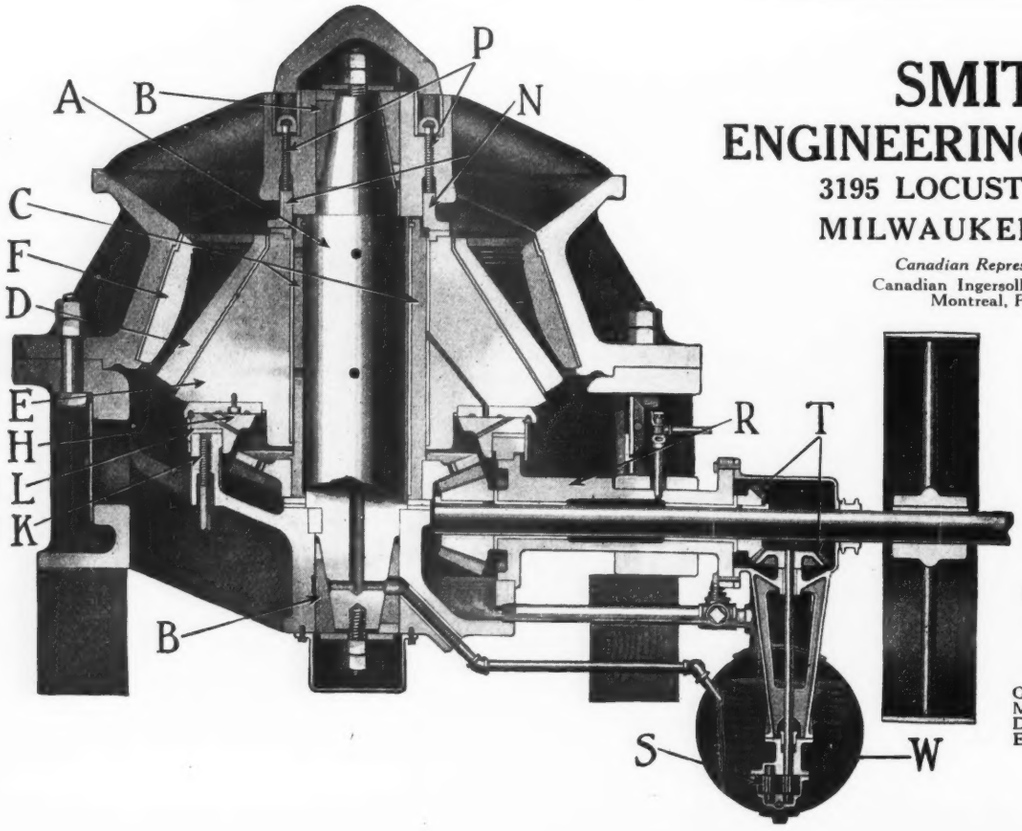
CHOKE FEED—GRAVITY DISCHARGE—STEEL FRAME, GUARANTEED AGAINST BREAKAGE BY TRAMP IRON—

It's a short, broad-shouldered brute—this Telsmith Reduction Crusher. It suggests the blind giant Sampson, crouched between the pillars of the Philistine temple, all set for the grand smash-up. With steel frame, steel crown and a short, fixed shaft, Telsmith's strength is apparent at the most hurried glance. Here's one machine that tramp iron can damage very little. Our two-year guarantee is a perfectly safe proposition.

But strength alone has not made Telsmith the premier secondary crusher of the day. Notice the huge flare of the mushroom head—the big bottom diameter. No machine can crush faster than it can discharge. It's the big flare of the crushing head that gives Telsmith such huge secondary crushing capacity.

Glad to send you bulletin No. 168 (Telsmith Reduction Crusher) and Catalog No. 2-F-1 (Telsmith Primary Breaker).

Sectional view of Telsmith Reduction Crusher. A—central shaft, hollowbored, with taper bushings. B. C—sleeve eccentric with die-cast babbitt sleeves. D—manganese steel mantle, zinced on grey iron core casting. E—head is adjusted by raising head support (H) by means of two jack screws (K) inserting or removing shims (L). F—manganese steel wearing plates. N—oil sleeve, kept snug against upper head plate by tightener screws (P). R—removable countershaft box, equipped with die cast babbitt bushings and adjustable sight feed. S—gear pump, driven by steel miter gears (T) lubricated by bath from countershaft box. W—oil storage tank, equipped with removable cover casting, brass strainer and drain plug.



SMITH ENGINEERING WORKS

3195 LOCUST STREET
MILWAUKEE, WISC.

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Short Story of a Big Achievement—

THE story of a machine which saves money. For all plants—small, medium, and large. A simple machine. A reliable machine. An efficient machine. One which reduces operating and production worries.

SIMPLICITY—the true test of a designer's ability. A machine that is simple is also easy to operate. Experienced labor is not required. There are no complicated mechanisms. Interruptions in production schedules are avoided.

(*Continued in the next issue.*)

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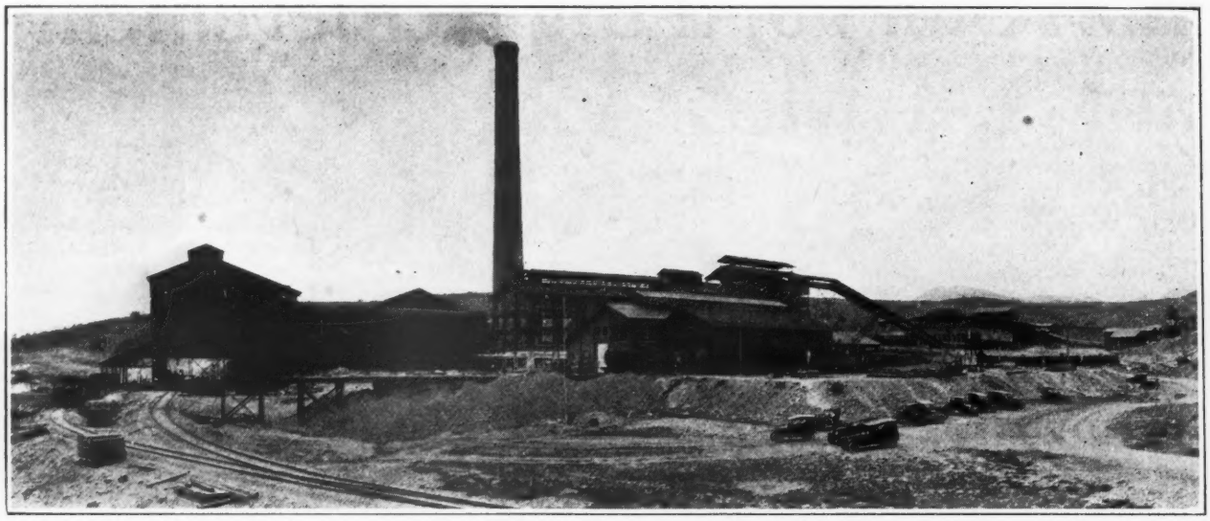
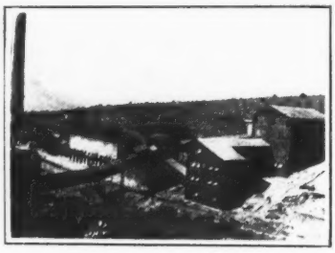
Offices in all principal domestic and foreign cities.

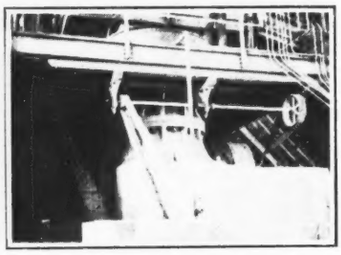
Ingersoll-Rand



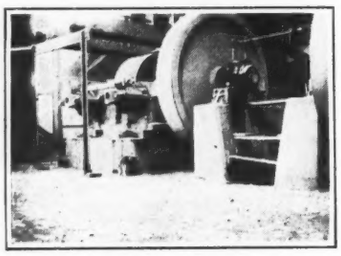
The New Magma Copper Co. Smelter,
Superior, Arizona



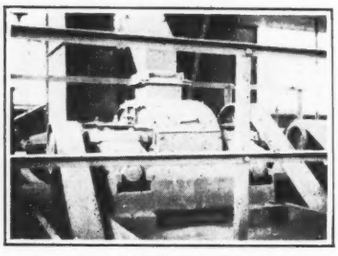
Crushing and Sampling Plant



16-in. Bulldog Gyratory



54x20-in. Traylor Rolls



18x10-in. Traylor Rolls

When Magma Copper Company

equipped their modern crushing and sampling plant at their new smelter, the best in crushing equipment was demanded, so it was only natural that they selected

Traylor Equipment

for this very important job, as they knew from past experience that out-of-work time and repair expense in Traylor Equipment had been reduced to the minimum.

Traylor Engineering & Mfg. Co.
Allentown, Pa.

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Cable Address "Forsaltra"
International Machy. Co., Santiago, Chile *W. R. Grace & Co., Lima, Peru*
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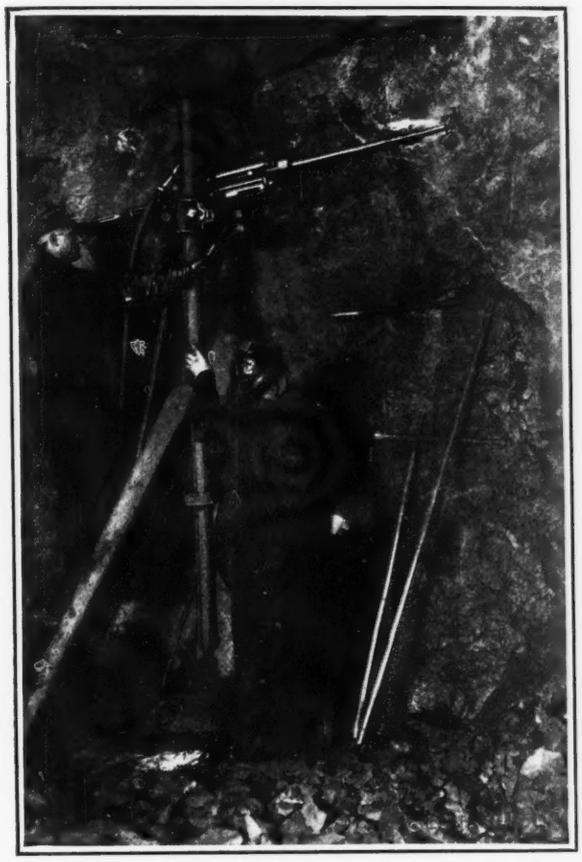
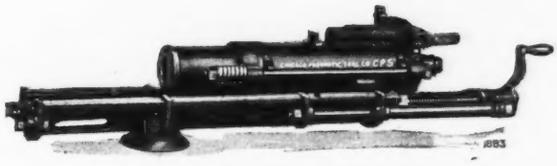


CP-5 Drifter in Champion Copper Company mine, Painesdale, Mich.



CP-5 Drifter

CP-5 "One-Man" Drifter

ARE you not interested in a "one-man" drifter —not a cradle-mounted hand drill—but a real DRIFTER, one that in most formations outdrills machines 35 to 60 pounds heavier?

Then you are looking for the CP-5 Drifter. And it weighs only 112 pounds! Men like to run it because it is fast cutting, easy to operate and it stays on the job.

The internal vibration that racks a drill and tends toward rising costs has been reduced to a minimum in the CP-5 with its true running balance. This, together with proper materials, workmanship and heat treatment, accounts for the exceptionally low upkeep cost. One of the large copper mines in Tennessee reports its CP-5 upkeep expense 50% lower than any other drifter used.

Consider the saving in weight—lighter drills, lighter mountings—and the saving in man power, also that the CP-5 is light enough for use in places where cradle-mounted hand drills have been employed heretofore and that a material increase in footage per drill may thus be obtained.

The trend is now towards lighter drills since the CP-5 has conclusively shown that correct design makes them possible. Many of you who have had experience with the CP-5 in various parts of the country can verify the foregoing statements. You who have not, are invited to make a thorough test of CP-5 Drifters under your own conditions, in your own way. Write our nearest branch office for details and Special Publication 697.

Chicago Pneumatic Tool Company

6 East 44th Street, NEW YORK, N. Y.

*Sales and *Service Branches all over the World*

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*Cleveland												*Winnipeg

Canadian Pneumatic Tool Company, Ltd., Montreal, manufacturers of Chicago Pneumatic products in Canada
Consolidated Pneumatic Tool Company, Ltd., London, manufacturers of Chicago Pneumatic products in England

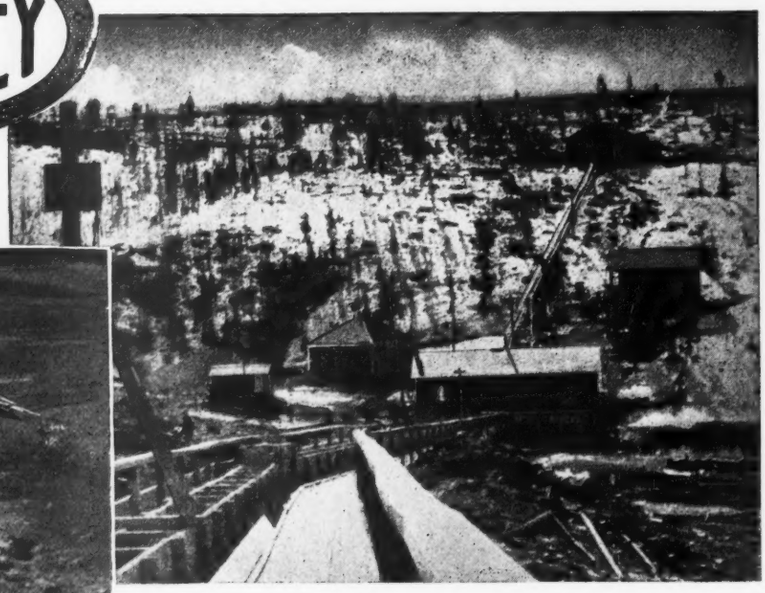
R-60

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES · · ROCK DRILLS · · COAL DRILLS

CHICAGO PNEUMATIC

Rock Drills

WILFLEY



Tailing Disposal

Two 6-in. Wilfley Pumps belted to 75 H.P. Motors.

Pumps placed in series.

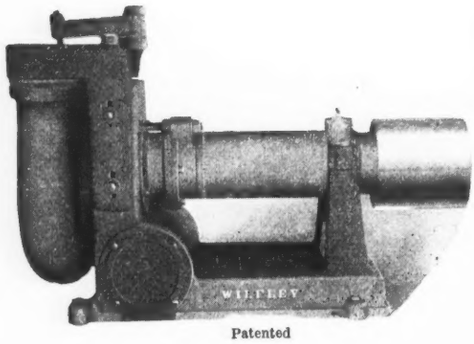
Material—Minus 20-mesh tailing.

Quantity—400 dry-tons per 10-hours.

Density—50% Solids.

Lift—Each pump operates against 100-ft. lift.

Life of wearing parts—Case 6 months; Runner and Follower 3 months.



Patented

These two 6-in. Wilfley Pumps replaced four 6-in. Pumps of the stuffing box type whose life of wearing parts averaged three weeks and life of shaft six weeks.

WILFLEY CENTRIFUGAL SAND PUMP

PATENTED

A. R. WILFLEY & SONS
DENVER, COLO., U. S. A.

"Leyner-Ingersoll" Features

Durability—The all-steel drop-forged construction assures long, uninterrupted, efficient service.

Lubrication—The "Heartbeat" automatic lubricator assures perfect lubrication, liberal quantity of liquid grease to all working parts.

Water Device — Eliminates dust, increases drilling.

Hole Blowing Device—Efficiently removes cuttings from hole under all drilling conditions.

Automatic Rotation.

Spring Retained Fronthead.

Efficient, Reliable Steel Holder.

Checking The Worth of a Rock Drill

Owners who check the real worth of a rock drill *consult and know* the record sheets in their office.

These record sheets show the footage drilled and the costs for maintenance and repairs. They show the actual time the drill is *underground on the job;* show the footage drilled for every dollar spent; show all facts—under actual working conditions—upon which future drill specifications can be safely based.

Owners who really check these records—both in their own and other mines—specify "Leyner-Ingersoll" Drifters. This is evidenced by the large number of repeat orders from users who have compared and know by experience the real worth of "Leyner-Ingersoll" drills.

INGERSOLL-RAND COMPANY, 11 BROADWAY, NEW YORK

Offices in all principal domestic and foreign cities

For Canada refer Canadian Ingersoll-Rand Company, Limited

260 St. James Street, Montreal, Quebec

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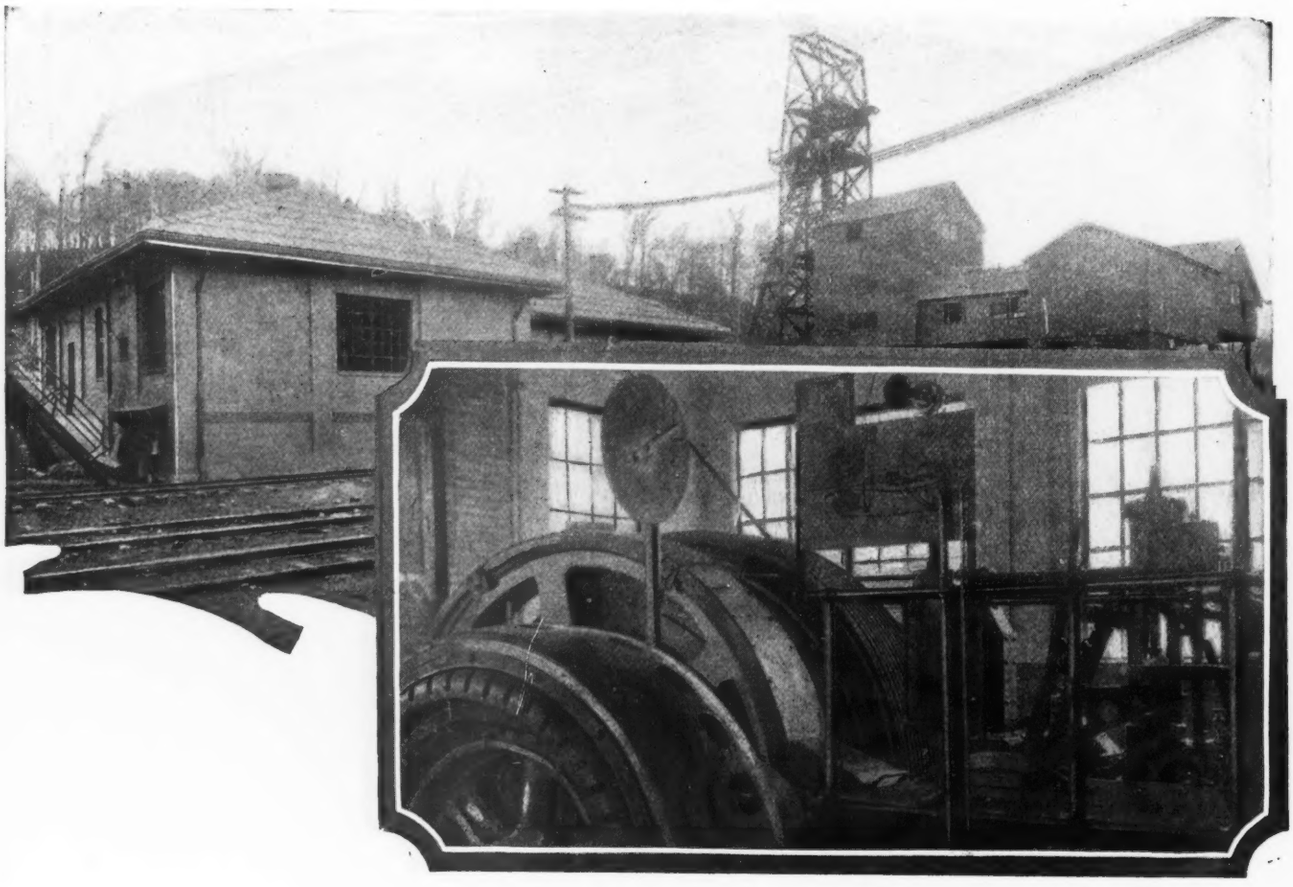


2,175 feet per minute and no danger of overtravel

The Vulcan Patented Travel Limit and Overspeed Device prevents overtravel and overspeed. And the operator cannot start the hoist the wrong way.

It's a 700 hp. Vulcan Hoist installed at the colliery of the Union Coal Company of Pittsburgh. It is completely equipped with Vulcan Safety Devices.

Capacity per hour, 450 tons. Weight of cage, 12,000 lbs.; car, 4,000 lbs.; coal, 7,000 lbs.

Let us advise you on the type of electric or steam hoist best suited to your conditions.

VULCAN IRON WORKS
1733 Main Street, Wilkes-Barre, Pa.

Other
Vulcan Equipment

- Steam Locomotives
- Gasoline Locomotives
- Rotary Kilns, Dryers, Coolers and Roasters
- Mine Ventilating Fans
- Cages and Skips
- Sheave Wheels
- Corliss Engines
- Coal Crushers and Rolls
- Gray Iron Castings
- Open Hearth Steel Castings
- Gears, Moulded and Cut Teeth
- Special Machinery

VULCAN OF WILKES-BARRE HOISTS

MINING THE ONLY EDIBLE ORE SALT

-at Retsof

In 1903 two G-E Locomotives and a Generator were installed at Retsof. The success of this installation led to complete electrification with General Electric equipment as follows:

Automatic Sub-station

1—435-KVA 2300-volt synchronous motor generator set with full automatic control.

Semi-automatic Sub-station

1—435-KVA 2300-volt synchronous motor generator set with semi-magnetic control (automatic on d.c., manual on a.c.) and switchboard with one d.c. and five a.c. feeders.

Out-door Sub-station

1—3000-KVA 60,000-volt sub-station consisting of switching tower, oxide film arrester, transformers and automatic oil switch.

Transformers

17—Type H transformers totalling 3915 KVA in sizes from 5 KVA to 1000 KVA.

Two Vertical Shaft Hoist Equipments

1—1050 h.p. and 1—200 h.p. motors with full magnetic control. Total hoist travel 1253 feet.

A. C. Motors

80—Motors aggregating 2000 h.p. used for operating car dump, hoisting and crushing machinery—in sizes from $\frac{3}{4}$ h.p. to 1050 h.p.

D. C. Motors

Many of these motors are used for operating shovel-loaders, pumps, etc.

Locomotives

4—Locomotives of 7- and 8-ton sizes haul mine cars.

Arc Welding

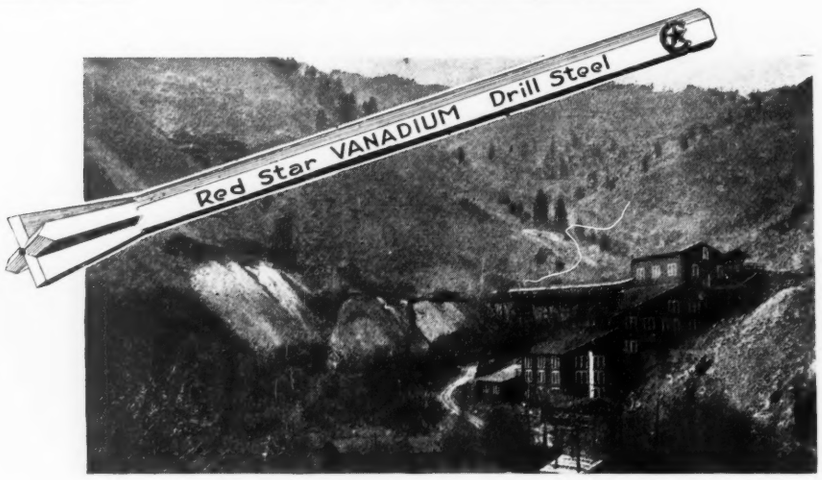
1—Type WD single operator set.

The engineering and manufacturing facilities of the General Electric Company are adaptable to the complete electrification of mining processes regardless of the minerals produced.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN ALL LARGE CITIES

RED STAR VANADIUM DRILL STEEL



In the mountains of Oregon, at this property of Homestead Iron Dyke Mines Company, no drill steel but Red Star Vanadium has been used for three years

COLONIAL No. 7

A Vanadium Tool Steel

THE father of Red Star Vanadium. Colonial No. 7 has back of it a long record of satisfactory performance under the most exacting conditions. Particularly adapted for use in Dies, Dollies, Pistons, Tappets and Hammers.

More cutting, less re-sharpening

WHERE supplies are difficult to bring in, and where the rock is hard, the Drill Steel that gives extra service is of *double value.*

Red Star Vanadium, with its record of endurance, is the Drill Steel to use on isolated properties. It is tough, dense; cuts fast, holds its edge, resists breakage.

Hardens and tempers as readily as straight carbon steel, Red Star Vanadium is a favorite with the mine blacksmith as well as with the drill runner.

The mines, like this Homestead big gold-copper property, that have long standardized exclusively on Red Star Vanadium, give substantial evidence of the good work it does.

In time and in dollars it will pay your mine to standardize on Red Star Vanadium. Get it from any Colonial Warehouse.

Colonial Steel Company

PITTSBURGH NEW YORK CHICAGO BIRMINGHAM ST. LOUIS
DENVER SALT LAKE CITY WALLACE PHOENIX EDW. L. SOULE CO., SAN FRANCISCO

MINING THE ONLY EDIBLE ORE SALT

Hoisting at Retsof Was Considered From Every Angle—"Ottumwa" Was Selected

Hoisting at the Retsof mine was considered from every engineering angle and a highly efficient installation has resulted. An Ottumwa skip hoist and Ottumwa service hoist (both electrically operated) were selected as most suitable for the work. The machines and auxiliary equipment are housed in a commodious well-lighted brick and steel building. The skips operate in balance, whereas a 10,500 lb. counter weight is used against the service cage.

The operating conditions for which the main hoist is designed are:

Weight of skip	15,000 lbs.
Weight of salt	19,000 lbs.
Total skip travel	1,253 feet
Size of rope	1¾ inches
Capacity per seven hours	3,000 tons
Rest period	10 seconds
Acceleration	10 seconds
Full speed	45 seconds
Retardation	10 seconds
Distance between sheaves	8 feet
Motor	1,050 hp.

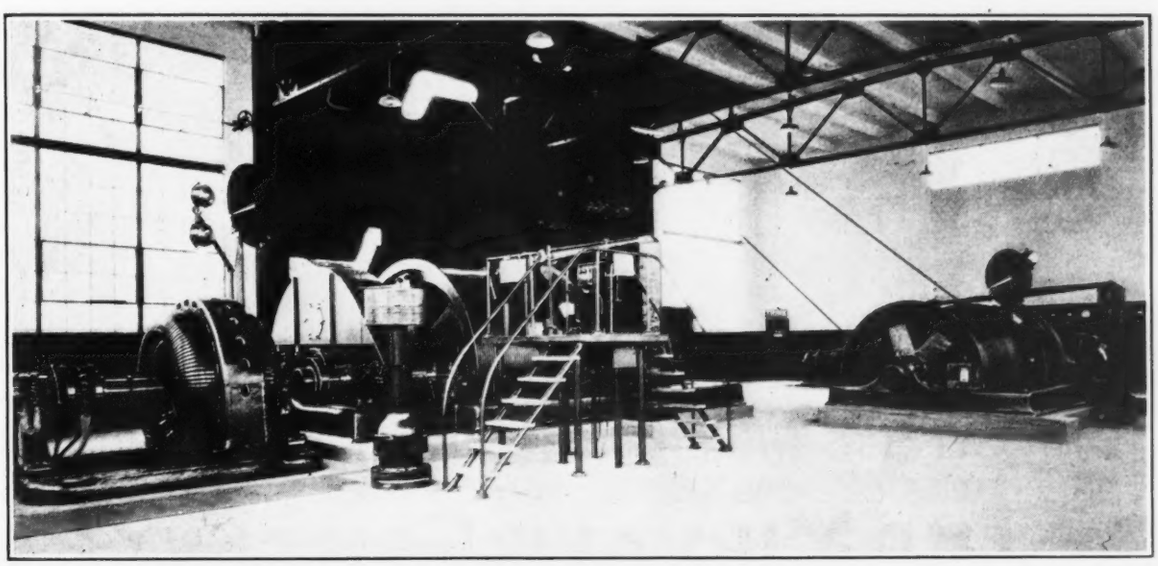
Current, 2,200 volt, 3 phase, 2 cycle

The safety features of both hoists include:

1. Over-speed is impossible.
2. Power is automatically cut off and the emergency brake set if the operator fails to retard when the skip approaches landings.
3. Overwinding is impossible.
4. Hoist cannot be started in wrong direction at either limit of travel.
5. Emergency brakes are not automatically applied under the above conditions until after an alarm has been sounded, which if heeded, prevents tripping.
6. Failure of current will apply brakes.
7. Failure of oil supply will apply brakes.
8. On removal of the cause of trouble the brake tripping mechanism is easily reset, and operation cannot be resumed until it is reset.
9. The operation of the safety devices is entirely independent of the will of the operator.

The drums on the large hoist are cylindro-conical, 8-ft. in diameter at the small end and 12-ft. on the cylindrical portion. The machine weighs 90 tons. It is connected to a 1050 h.p. motor through a single reduction herring-bone gear.

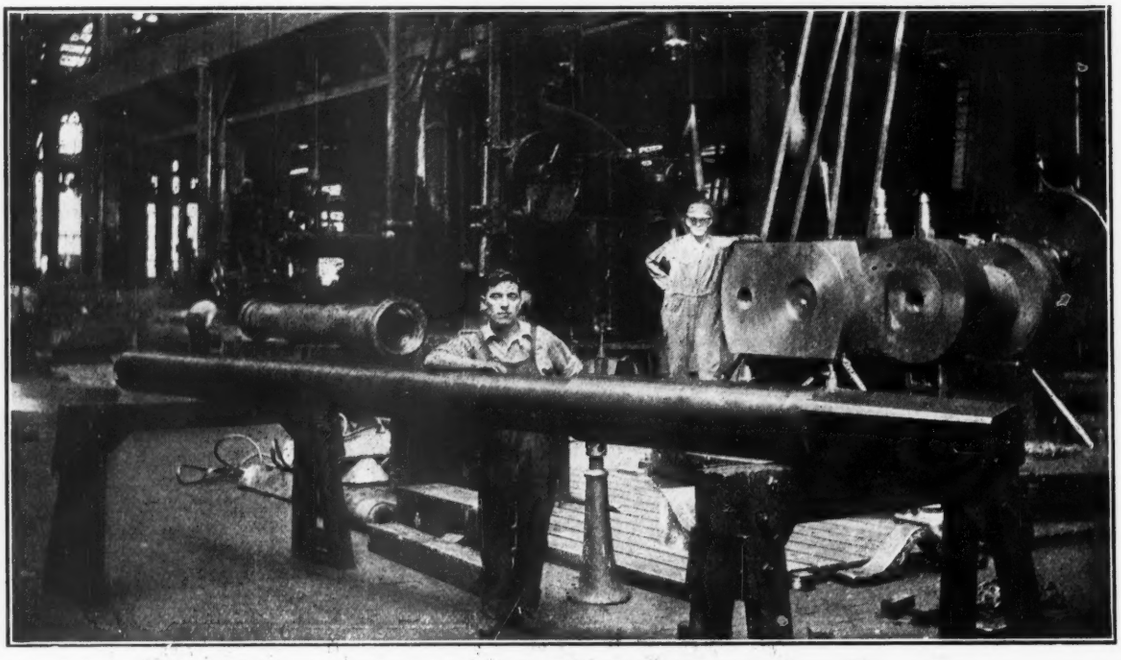
Ottumwa Hoists are built for the hardest service.



OTTUMWA IRON WORKS
OTTUMWA, IOWA

MIDVALE

Alloy Steel Shafts



Cutter Shaft for a Dredge

This forging was made from Special Alloy Steel cast in our own open hearth plant, carefully heat treated and then finish machined in our own shops with Tool Steel of our own manufacture. This particular type of steel is admirably fitted to withstand the heavy repeated loads and shocks imposed upon it, and has made surprisingly satisfactory records wherever used. Our ability to perform every step in its evolution from the open hearth furnace to the finishing process is the primary reason for its superiority.

Drill Steel Mine Locomotive Tires Billets

THE MIDVALE COMPANY

WORKS AND MA N OFFICE:

NICETOWN

PHILADELPHIA, PENNSYLVANIA

District Offices:

NEW YORK	PITTSBURGH	WASHINGTON	CLEVELAND	CHICAGO	SAN FRANCISCO
165 Broadway	Grant and 5th Aves.	15th and H St., N.W.	925 Euclid Ave.	332 S. Michigan Ave.	681 Market St.

Tool and Alloy Steel Warehouses:

BOSTON PHILADELPHIA CLEVELAND CHICAGO SAN FRANCISCO

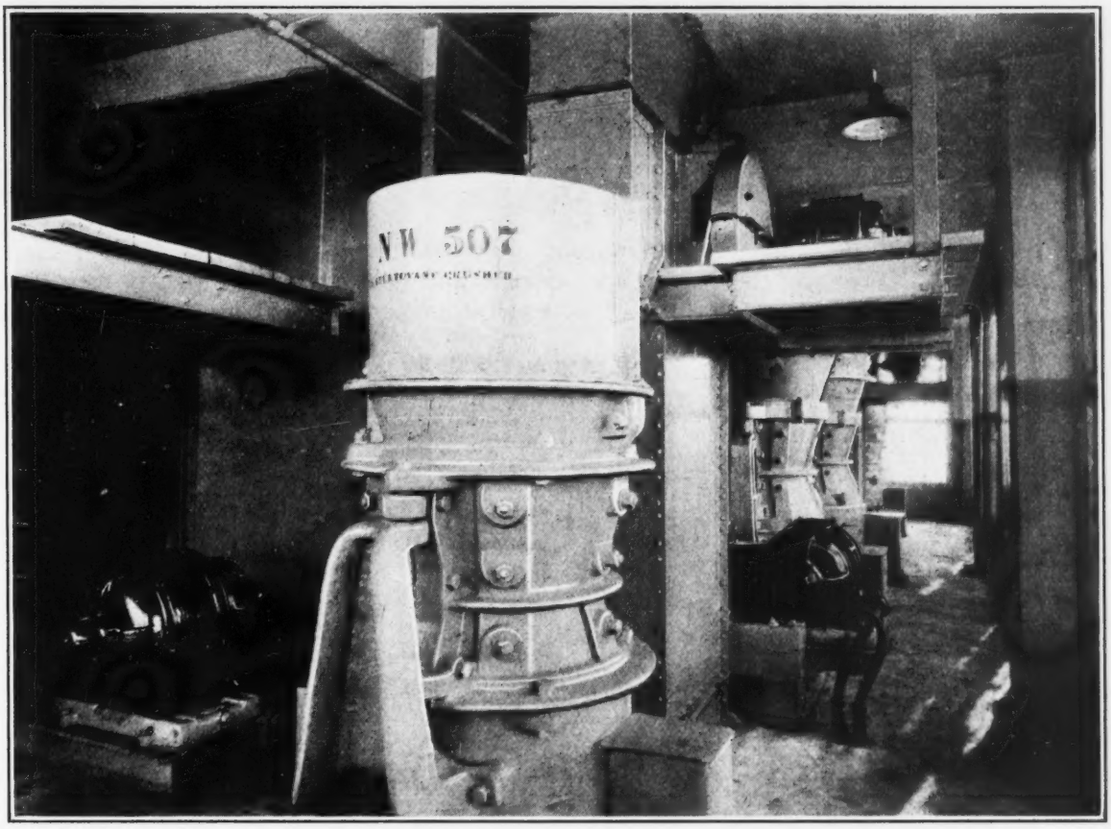
MINING THE ONLY EDIBLE ORE SALT

Eight Sturtevant Fine Crushers Give Effective Service at Retsof

The principal machines used for crushing at the mill of the Retsof Mining Co. are eight Sturtevant Fine Crushers—four No. 2 Crushers, which take 8-inch feed and reduce to 1¼ inch, and four No. 1½ crushers which crush to one inch. These crushers embody the latest engineering practice and are highly successful.

Like all Sturtevant Mill Co. products the wearing parts are of the best material for the purpose of preventing excessive wear.

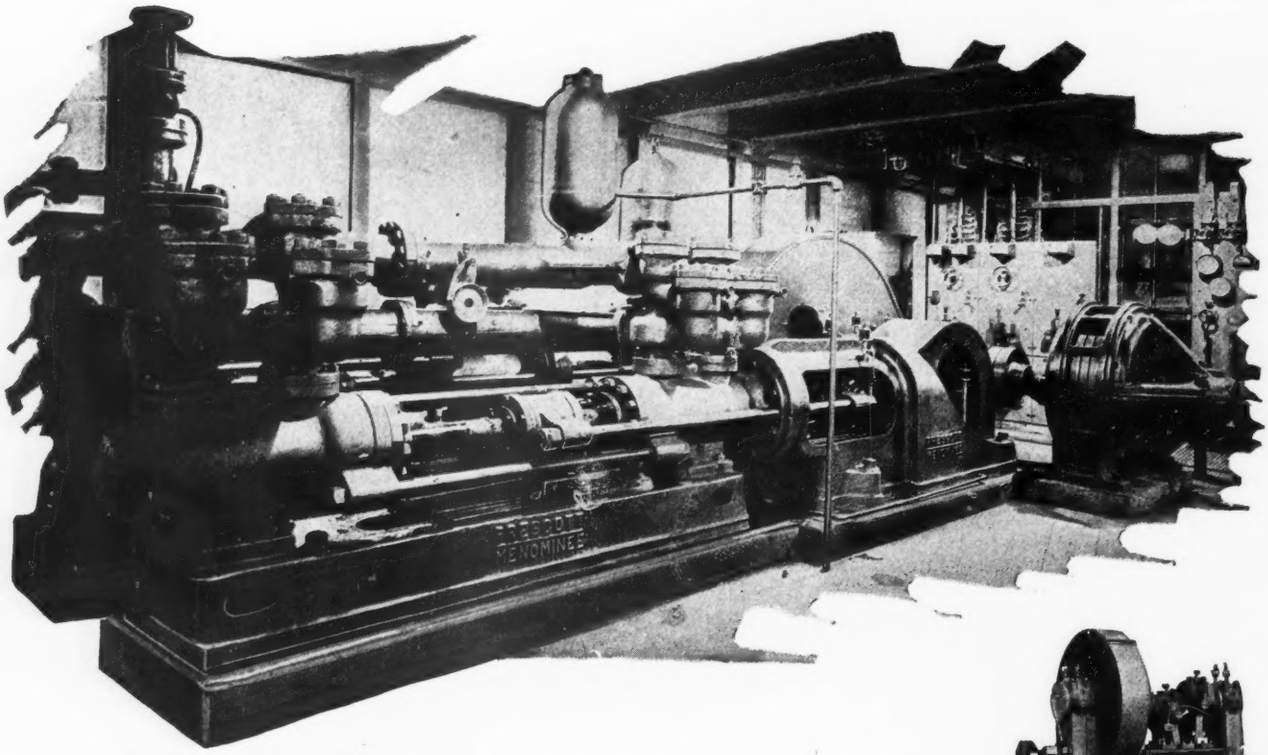
Sturtevant engineers, designers, consultants and erectors gladly cooperate with engineers, or executives of mines, mills and smelters in the selection of the most suitable apparatus for crushing, grinding, pulverizing, shredding, air separating, screening, grading, mixing, weighing, elevating and conveying.



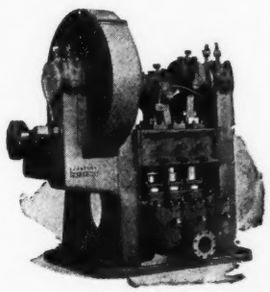
STURTEVANT MILL CO.

Harrison Sqare

BOSTON, MASS.



Dependable continuous pumping



Prescott-Menominee Triplex Pumps are strong, rugged pumps of massive construction. They embody all the features essential to a good mine pump.

In most mines water keeps flowing in every moment of the twenty-four hours, 365 days in the year. It never slackens out of consideration for pump breakdowns or other pumping handicaps.

That is why only reliable, dependable, day-in-and-day-out pumping equipment should be installed in a mine. It explains why the Prescott Company's paramount effort is to build dependability into mine pumps, insuring the strength and stability to withstand the hardest non-stop service.

The design, materials and workmanship in Prescott-Menominee Pumps are all such as to produce a pumping unit of utmost dependability. The construction of these pumps throughout is the result of long experience in solving mine pumping problems, and thorough knowledge of how severe the conditions are that have to be met in deep mine pumping.

Write for detailed information regarding Prescott-Menominee Pumps.

The Prescott Company

Fred. M. Prescott, Pres.

Menominee, Mich.

PRESCOTT
MENOMINEE

MINING THE ONLY EDIBLE ORE SALT

Myers-Whaley Electrically Driven Loaders Have Replaced Hand-Shoveling at Retsof

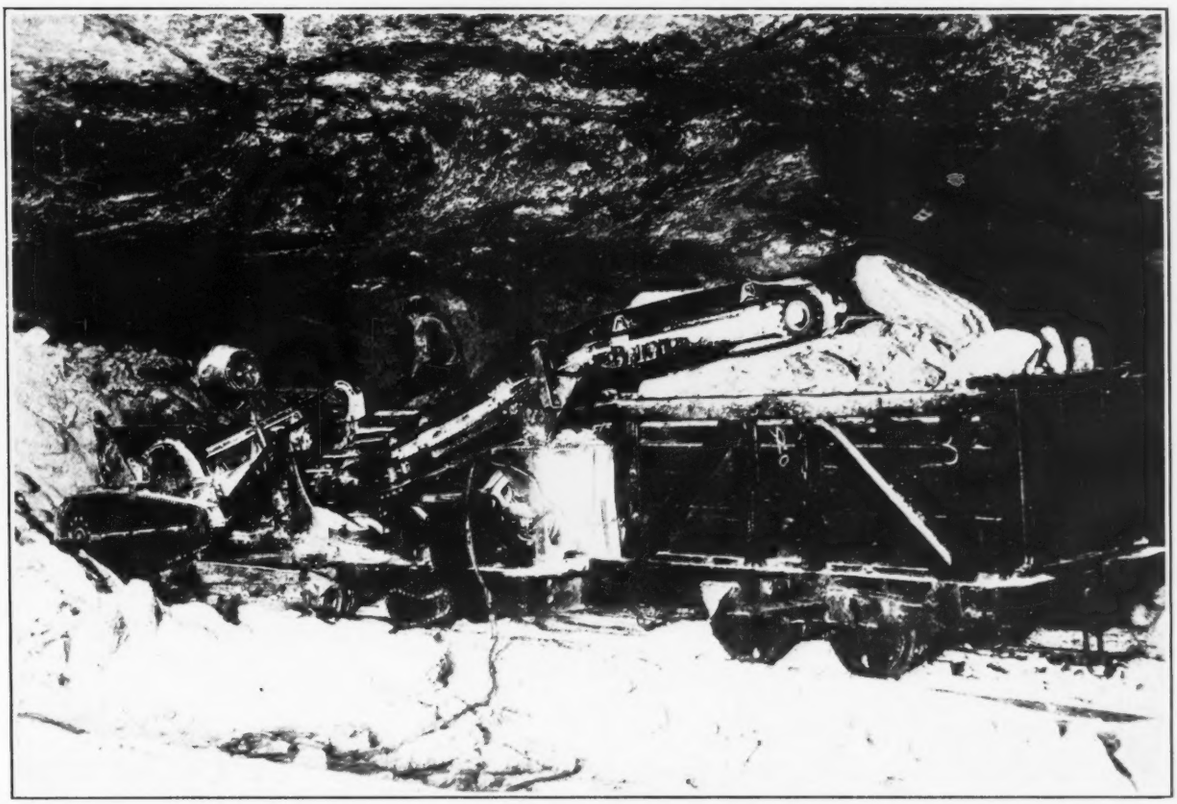
The Retsof Mine has been using "Myers-Whaley" Shovels for *eleven years* with consistently good results.

And now practically all the loading of Rock Salt is done with "Myers-Whaley" electrically driven machines. For the entire year 1923 the *average* loading was approximately 196 tons *per machine per shift.*

These machines represent the highest development in the art of mechanical loading.

Modern mining operations demand more economical and more efficient methods, hence the increasing widespread use of "Myers-Whaley" Shoveling Machines throughout the mining industry. In Rock, Ore or Coal, they serve efficiently, economically and durably.

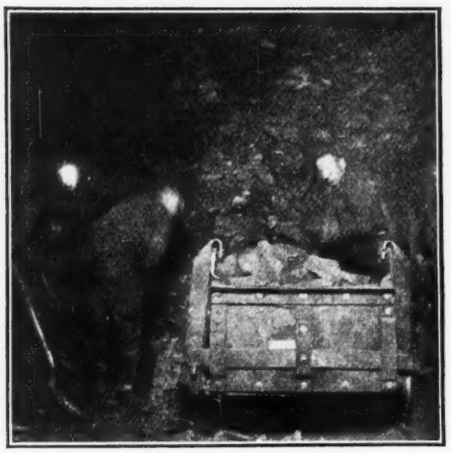
We will be glad to furnish information and advice on your loading problem.



MYERS-WHALEY COMPANY
KNOXVILLE, TENNESSEE

Mill or Mine

?



Where are bigger profits to come from?

The farther you extend your workings, the higher your cost per ton rises. If net profit is to hold its own, where is the extra revenue coming from? Not from a rise in the market—you can't control that. Not from the ore itself — you can't change the richness of the vein.

If revenue is to increase, it must be as a result of internal economy—savings brought about through more efficient operation and management.

Where profits escape

Progress in the mining industry has been great within recent years. But most of this progress has been made above ground—in the efficiency of mill equipment and the methods of handling and treating ore.

Below the surface the advance has not been so marked. Savings made on the surface are too frequently offset by inefficiency between stope and shaft.

One of the worst breeders of unnecessary expense is the underground haulage system. Haulage adds directly to the cost of every ton of ore moved. It also indirectly adds to the cost of other important phases of operation, for the entire mine can move no faster than the ore moves.

What other mines have done

There are many ways of reducing haulage expense. You can concentrate your working places to a greater degree. You can use heavier rails, grade track, widen curves, and replace home-made frogs, switches, etc.

You can buy sturdier or larger mine cars and keep them in good repair. You can systematize tramming routes. Even when these improvements involve a large initial outlay they pay for themselves in a surprisingly short time. If you use storage battery locomotives, however, there is still another important way to cut your haulage cost, and it does not involve a large initial outlay.

That way is to choose a battery that will handle more ore day after day, year in and year out, and at far less cost per ton than you have probably ever thought possible.

Increasing your tonnage

You can't break any tonnage records when muckers have to wait for cars. But when your motors are equipped with Exide-Ironclad Batteries, motormen should have no difficulty in handling all the ore that can be loaded.

Two things a battery must have if haulage is to be speeded up. One is constant high voltage. The other is ample reserve power. The voltage of the Exide-Ironclad remains high right down to the end of its discharge period. High voltage in a battery means high speed in the locomotive, and in the afternoon you will appreciate the good speed maintained with the Exide-Ironclad.

Furthermore, this battery has a tremendous reserve power. You do not have to favor the motor because of one or two stiff grades for, if necessary, the Exide-Ironclad can deliver power at *twenty-eight times* its normal discharge rate.

Cutting your cost per ton

Not only can you produce more tons of ore a day with Exide-Ironclad Batteries, but you can cut the cost of producing those tons.

The Exide-Ironclad's power efficiency is high, so its expense for current is low. It responds readily to charging—you can boost it at odd times, such as lunch hour, when working under pressure. Its normal working life under average conditions is better than three years.

If you are interested in giving haulage expense more serious consideration, you should have our booklet, "Facts for Consideration in *Selecting a Battery* for Locomotive Service," form 1791. We will gladly send you a copy.

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

In Canada, Exide Batteries of Canada, Limited, 133-157 Dufferin Street, Toronto

MINING THE ONLY EDIBLE ORE SALT

An "All Steel" Buchanan Sectional Jaw Crusher Crushes the Oversize at Retsof

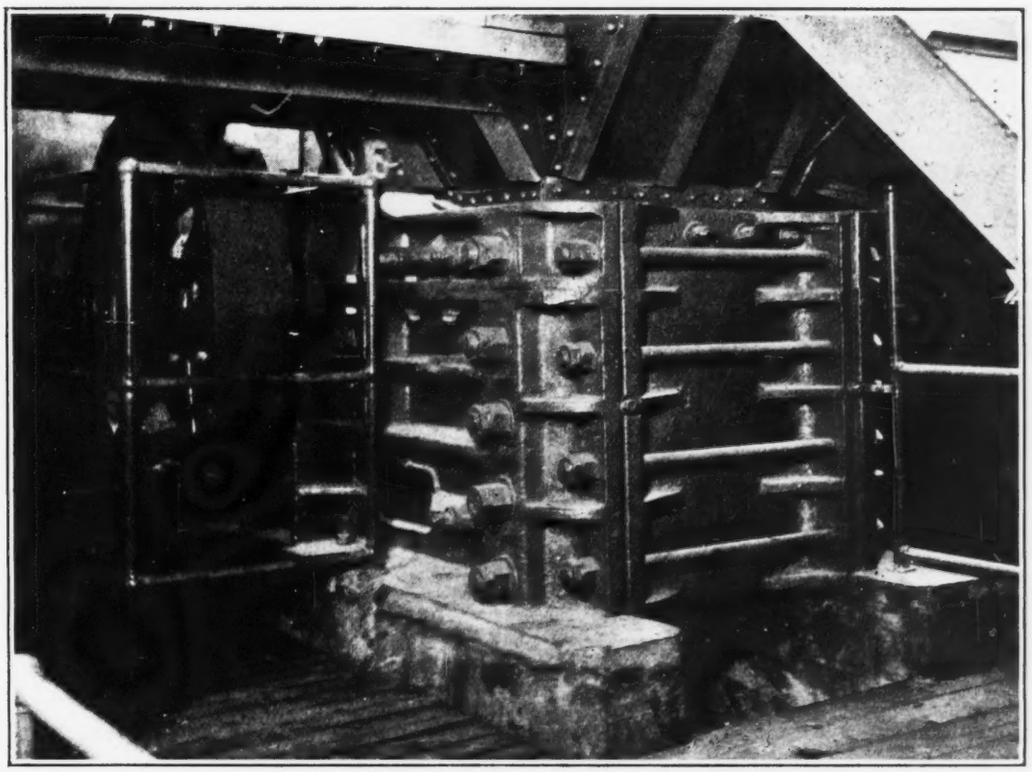
The salt slides down an inclined bar screen through which the pieces under 8 in. pass directly to the skip-storage hoppers. The oversize passes through a 30x42-in. "All Steel" Buchanan Jaw Crusher set with a maximum opening of 8 in., the crushed product joining the undersize is automatically split between the two hoppers that fill the balanced 9-ton skips of the main hoisting plant.

All joints have heavy tongue and groove *entire length* of joint, plus large turned body bolts in drilled and reamed holes. *No loose keys used.* Sectionalized so that the parts of the largest crusher can be safely lowered in any mine shaft large enough to handle the product tonnage of crusher selected. Many mining companies (names on request) have had these sectionalized crushers in operation over ten years. *Write for Bulletin.*

Steel castings are carefully annealed and all shrinkage strains are entirely removed. Bearings have double system of lubrication, are water-jacketed, and in the larger sizes are removable.

Buchanan "All Steel" Jaw Crushers are built in sizes from 24x36 in. to 66x84 in. The Manganese Steel Jaw Plates are made sectional.

Write for Bulletin No. 10



C.G. BUCHANAN COMPANY Inc.
West and Cedar Streets
NEW YORK CITY

Ready for full capacity?

Oxweld Portable Outfit

The Ambulance of Industry

THE oxy-acetylene welder's portable truck outfit made by Oxweld has frequently been called the ambulance of industry. By means of this little truck a complete oxy-acetylene welding and cutting outfit with cylinders can be transported easily and rapidly to any part of your plant. Repairs can be made quickly and economically and long and expensive shut-downs avoided. Frequently parts may be repaired without dismantling the machine, and nearly always repairs can be made on the spot, thus avoiding the necessity of carrying broken parts through your plant.

If you wish to save money on plant maintenance, send for the nearest Oxweld Resident Engineer.

IS YOUR PLANT ready for full capacity production?

Have your engineers and master mechanic seen to it that every piece of machinery is in operating condition? You realize that periods of part-time or shut-down are ideal for making repairs.

Oxy-acetylene welding will repair many machines at a fraction of the cost of replacements. Oxy-acetylene welding will enable you to reclaim many broken or rejected parts. Oxy-acetylene cutting will help you make changes rapidly and economically.

If you use Oxweld welding and cutting apparatus, Oxweld engineers and fieldmen will gladly show you how the oxy-acetylene process can help keep your plant equipment in working condition at all times. Send for free book, "Oxweld Can Do It." It illustrates many applications.

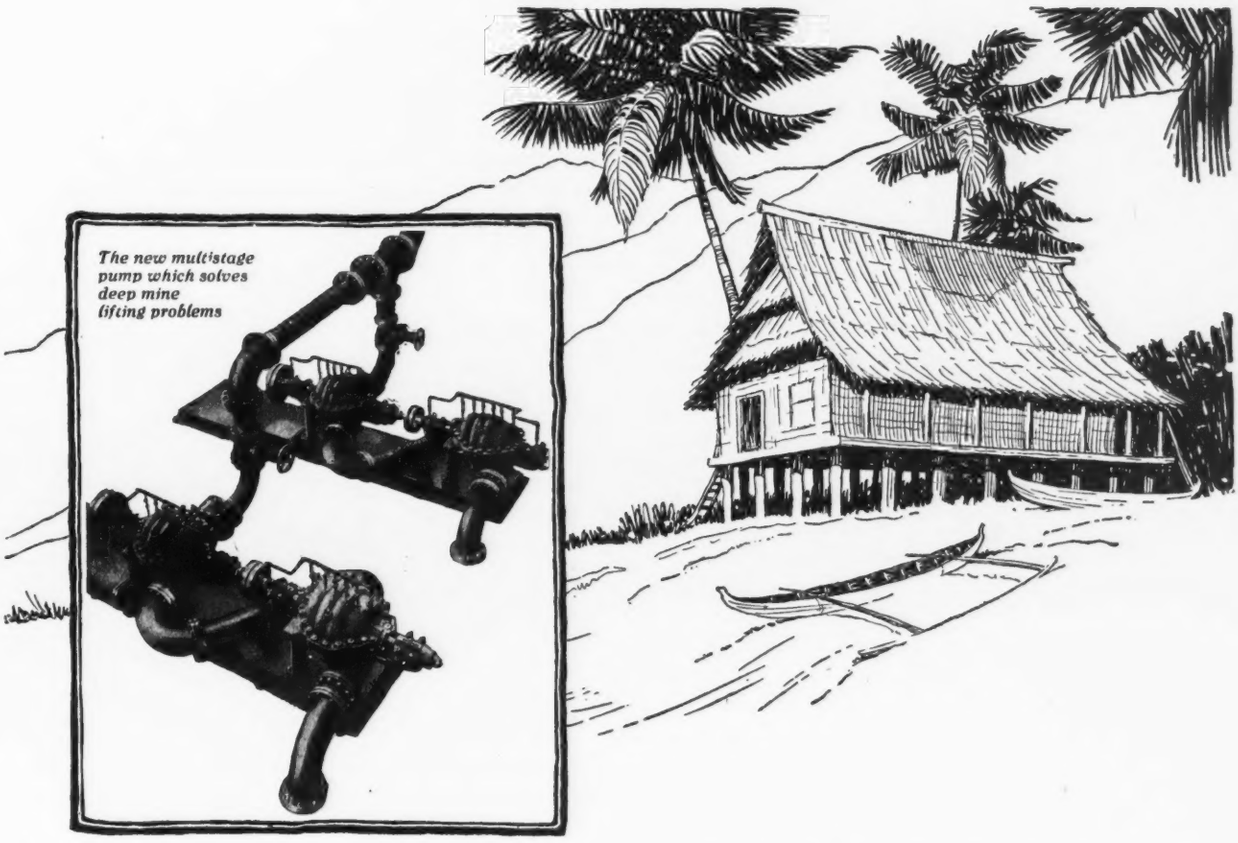
OXWELD ACETYLENE COMPANY

Chicago 3642 Jasper Place
Long Island City, N.Y. Thompson Ave. & Orton St.
San Francisco 1050 Mission Street

Oxweld

WELDING AND CUTTING APPARATUS

WORLD'S LARGEST MANUFACTURERS OF WELDING AND CUTTING EQUIPMENT



"Our pumping problem was difficult and complicated"

"We have now had your Byron Jackson pumps in operation a year and we think you will be interested in hearing how satisfied we are with their use.

"We are glad to inform you that the equipment has given every satisfaction and has substantially simplified our pumping problem which was a very difficult and complicated one."

Thus writes the Redjang Lebong Mining Company in far away Lebong Donok, Dutch East Indies, regarding their Byron Jackson Multistage station pumps. The international recognition given to Byron Jackson Pumps in the mines, the industries and on irrigation projects of the world is a coveted distinction enjoyed by this company.

Builders of standard and special pumps for all needs.

BYRON JACKSON PUMP MFG. CO., INC.

Wherever water is to be lifted

411 Sharon Building - SAN FRANCISCO

LOS ANGELES VISALIA
SALT LAKE CITY PORTLAND, OREGON

BYRON JACKSON Service PUMP MFG. CO.

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads. (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches..... $4.50 an inch
4 to 7 inches..... 4.30 an inch
8 to 14 inches..... 4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.&M. J.-P.

EMPLOYMENT SERVICE

SALARIED men seeking tentative offers of new connections, are invited to communicate confidentially with the undersigned, who will negotiate overtures without jeopardy to present connections. A professional, ethical service, restricted to high grade positions; established 1910. Retaining fee refunded as provided in our "Refund Contract" if service is not satisfactorily rendered as per contract, and such refund be requested within three months from date remitted. Send name and address only for particulars. R. W. Bixby, Inc., 704 Lockwood Building, Buffalo, New York.

EXECUTIVES, engineers, $3,000-$25,000 will find our individual, confidential service an effective medium in making new connections. Personally conducted by Mr. Jacob Penn, the eminent employment authority, known to leading business men throughout America. Our refund agreement protects you. Not employment agency. Jacob Penn., Inc., 305 Broadway, New York.

POSITIONS WANTED

CAPABLE mine accountant; ten years' experience; at present with high-grade gold mine; married; healthy, young; will go anywhere living conditions are better than present; foreign contract acceptable. PW-25, Eng. & Min. Journal-Press, 10th Ave. at 36th St., New York.

E. M. technical graduate, experienced in underground and open pit mine development and extraction, seeks responsible position which affords opportunity for advancement commensurate with ability. Three years' engineering, four years' business experience. Age 29, single. References. Versatile and reliable. At present employed. Available on two weeks' notice. Location preferably in States. PW-37, Eng. & Min. Journal-Press, Leader-News Bldg., Cleveland, Ohio.

ERECTING engineer, world-wide experience plant design and erection; break-in and handle any labor. Erect plants anywhere. References exchanged. Address PW-35, Engineering and Mining Journal-Press, Old Colony Bldg., Chicago, Ill.

MINING engineer, technical graduate, nine years' practical experience in gold and silver mines, best references, open for engagement July 5th. Box 71, Station J Post-Office, 309-11 West 125th St., New York City.

MINING and metallurgical engineer desires charge of property, plant or consulting work; long, varied, local and foreign experience; excellent Spanish; location immaterial. PW-9, Eng. & Min. Journal-Press, 883 Mission St., San Francisco Calif.

MINING geologist and engineer, age 33, family, wants position with mining company in Southwest or Mexico. Experienced in civil and mine geological surveys, 10 years. Willing to undertake scouting or directing mine development in this or foreign country. Some knowledge of Spanish and Mexican. PW-36, Engineering & Mining Journal-Press, 883 Mission St., San Francisco, Calif.

POSITIONS WANTED

PURCHASING agent, employed in Mexico with metal mining concern, is desirous of making a change, either in Mexico or the West or Southwestern part of the United States; best of references. PW-31, Eng. & Min. Journal-Press, Old Colony Bldg., Chicago, Ill.

BOOKS & PERIODICALS

Wanted

Will pay $1 for a copy of the March 31, 1923, issue of Engineering & Mining Journal-Press, in good condition. American Cyanamid Co., 511 Fifth Ave., New York.

WANTED

BALL MILL

1—Small, about two tons daily capacity. State condition and price.

THE BASIC MINERAL CO.
N. S. Pittsburgh, Pa.

DORR RE-ACTION TANKS

3—Dorr re-action tanks, 10x10-ft., complete with agitators and steam coils.

Price and specifications on request

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

BOILERS AT LOW COST

12—823 hp. Babcock & Wilcox Stirling Water Tube Boilers, Class M-30, 200 lbs. pressure. Westinghouse stokers and all accessories.
2—300 hp. Heine boilers, 150 lbs. pressure. Murphy stokers and accessories.
Write for list of Power House Equipment

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

NEW AND USED

MINING MACHINERY

WE BUY — Complete Plants Installed or Disposed of — WE SELL

Write or Wire Your Needs

J. E. KNAPP CO.,
525 Market St., San Francisco, Cal.

Machinery For Sale

Mining and Milling Machinery. Write for list and prices.
Three Complete Mills. In whole or part.

GEO. H. MURPHY
959 Walnut St., Boulder, Colo.

NEW AND REBUILT

Mining and Milling Machinery

Send for Complete List

Agents for:
Allingham Flotation Machines

ROSENBURG CO. LOS ANGELES — Rosenburg & Co.

3rd & San Pedro Sts. Los Angeles, Cal.
8th, Madison & Jackson Sts. Phoenix, Arizona

3—Model C Dorr Duplex

Classifiers

Iron Tanks
Price $750 each

Mines Supply & Machinery Co.
589 Bryant St., San Francisco, Cal.

ELECTRICAL EQUIPMENT

125—Motors ¼ to 150 hp.
22—Type H No. 211982 (W) oil circuit breakers.

Write for Bulletin 21 listing large stock of motors, generators, transformers, condulets, panels, switches, etc.

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

FILTER PRESS

1—18-in. Iron Type Sperry filter press. Used, but in good condition.

Write for price and description.

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

FOR SALE

ELECTRIC HOIST

1—Wellman-Seaver-Morgan. Drum 6-ft.x 6-ft. Gears, herringbone. Speed 750 feet per minute.

BUFFALO IRON MINING COMPANY
Iron River, Mich.

WANTED

8 Filter Presses
4 Ball Mills
3 Tube Mills

W-999, Eng. & Mining Journal-Press 10th Ave. at 36th Street, New York City

"Opportunity" Advertising:

Think "*SEARCHLIGHT*" First!

0100

Rails!

When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY

"The House of Dependable Service"

122 South Michigan Avenue, Chicago

Dealers in New and Relaying Rails, Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; Detroit, Book Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco. *Cable Address:* "Hymanmikel"

World's Largest Distributors of Rails

Used Milling Equipment

Service and Quality at a Saving in Cost

3—20 ft. x 9 ft. **Dorr Thickeners** complete with Redwood Tanks. Price $1000 each.

1—20 ft. x 9 ft. **Dorr Thickener** mechanism complete but without tank. Price $650.

2—18 ft. 6 in. x 9 ft. **Dorr Thickeners** and Redwood Tanks. Price $950 each.

1—Model C **Dorr Duplex Classifier**, 4 ft. 6 in. x 14 ft., with new steel tank. Price $950.

Prices F.O.B. Hurley, N. Mex.

All above in excellent condition.

For Immediate Shipment

Eastern Iron & Metal Co.

345 West Seventh South St., Salt Lake City, Utah.

Thyle Machinery Co.

formerly

A. H. SIMPSON CO.

Rebuilt Machinery

129 Fremont St., San Francisco

The Best Used Equipment for the Least Money

MOTORS

3 Phase, 60 Cycle, 440 Volt

1—1000-hp. Allis-Chalmers, 225 r.p.m., 2300 v.
1—225-hp. General Electric, 900 r.p.m.
1—200-hp. Westinghouse, 580 r.p.m.
1—100-hp. General Electric, 900 r.p.m.
1— 75-hp. General Electric, 720 r.p.m.
1— 50-hp. Allis-Chalmers, 1200 r.p.m.
1— 50-hp. Fairbanks, 1800 r.p.m.
1— 40-hp. Crocker-Wheeler, 1200 r.p.m.
1— 35-hp. Fairbanks, 1200 r.p.m.
2— 30-hp. Westinghouse, 1200 r.p.m.
1— 20-hp. Westinghouse, 900 r.p.m.
1— 20-hp. Crocker-Wheeler, 900 r.p.m.
2— 15-hp. General Electric, 900 r.p.m.
1— 15-hp. Crocker-Wheeler, 1200 r.p.m.
1— 10-hp. Westinghouse, 1200 r.p.m.
1— 10-hp. Crocker-Wheeler, 1800 r.p.m.
1—7½-hp. General Electric, 1800 r.p.m.
1— 5-hp. Westinghouse, 1200 r.p.m.

FILTERS

1—14x12½-ft. Portland Continuous Filter.
1—12x12-ft. Portland Continuous Filter.
4—12x 9-ft. Portland Continuous Filters.
1— 6x 4-ft. Portland Continuous Filter.

SMELTING MACHINERY

2—48x180-in. Colo. Iron Works Blast Furnaces.
1—40x144-in. Colo. Iron Works Blast Furnace.
1—42x120-in. Davis Blast Furnace.
1—42x120-in. Traylor Blast Furnace.
1—36x120-in. Colo. Iron Works Blast Furnace.
1—42-in. Round Blast Furnace.
2—No. 8 Connersville Blowers.
2—No. 7 Connersville Blowers.
1—No. 6 Connersville Blower.
1—No. 7 Greene Blower.
Slag Pots, Matte Pots, Settlers, Etc.

TRAMWAYS

1—7-Mile Leschen Complete Tramway.
1—2-Mile Leschen Complete Tramway.
1—3-Mile Leschen Complete Tramway. Equipped with automatic loading and unloading terminals.
1—1-Mile Bleichert System Tramway.

Advise us your requirements. Full specifications and quotations will be sent at once.

Morse Bros. Machinery & Supply Co.

Broadway and Wewatta, Denver, Colo.

Almost complete paralysis of the local demand for machinery compels us to seek distant markets. We offer our very large stock of modern, slightly used machinery at prices permitting shipment to distant points.

HYDRO-ELECTRIC POWER PLANT

2—242 kw. each, 2200 or 4000 v., G.E. generators, with exciters, switch boards, etc., belt connected to 6-ft. Pelton double water wheel, has been operated under 500-ft. head, is practically unused.

ELECTRIC HOISTS

All Motors Are 3 Phase, 60 Cycle.

1—300-hp. double drum, for unbalanced load of 10,400 lbs., Westinghouse 2200 v. motor, panel switch boards, two 1⅛ in.x2250 ft. good wire ropes. Weight bare hoist, 111,000 lbs., complete outfit about 131,000 lbs.
1—150-hp. double drum, with 440 v. G.E. motor.
1—112 hp. almost new single drum with 440 G.E. motor.
18—10 to 75-hp. single drum, 440 v. motors.

MISCELLANEOUS HOISTS

1—16x32 first motion Ottumwa single drum, steam.
30—Geared single drum, steam, 5x5 to 10x12.
1—7x10 tandem drums, contractors', connected to 100 lb. vertical boiler.
1—12-hp. Fairbanks-Morse gasoline.
2—25-hp. Fairbanks-Morse gasoline.

AIR COMPRESSORS

With or Without Motors

1—1400 cu. ft. Ingersoll-Rand Imperial, short belt drive attachment and leather belt, 250 hp., G.E. 2200 v. motor. Belt and motor used four hours.
1—750-ft., 2-stage Sullivan (old machine, but in good condition and very cheap). 140 hp., 2200 v., G.E. motor.
1—677-ft. Ingersoll-Rand Imperial, 100 hp., 2200 and 3800 v., G.E. motor.
1—445 cu. ft. WJ-3 Sullivan Angle-compound, short belt drive attachment, belt, 75 hp., 2200 v. motor.
8—9x8 and 12x10 Ingersoll-Rand, Class ER-1, some with, some without short belt drive attachments and belts, 440 v. motors.
1—8x8 Gardner, 25-hp., 440-v. motor.

STEAM DRIVEN COMPRESSORS

25% of Value

1—690 cu. ft. Chicago-Pneumatic Tool cross compound air and steam.
4—12x14x9x14, 396 cu. ft. Sullivan, Class WB-2, single steam, 2 stage air.

ELECTRIC PUMPS

1—300 gal., 1000 ft. horizontal duplex plunger, with or without motor.
1—New 7x8 Goulds triplex, 200 to 250 gal., 350 ft. with new 30 hp. Westinghouse, 440 v. motor.
1—Used 7x8 Goulds triplex, 200 to 250 gal., 350 ft. with new 30 hp. Westinghouse 440 v. motor.
1—650 gal. Aldrich triplex, 175 ft. without motor.
1—50, 70 or 85 gals., 500 ft. Aldrich triplex, with 15 hp. 440 F., G.E. motor.

STEAM PUMPS

11—10x7x5x10 Knowles sinkers.
8—9-B Cameron sinkers.
2—9 Cameron sinkers.
2—7 Cameron sinkers.
1—12 and 24x6x12 Prescott duplex tandem compound pot valve station, 300 gal., 1000 ft., practically new, 25% of value.
1—Worthington duplex compound 225 gal., 700 ft.
10—Duplex plunger station pumps, 200 to 400 gal. various lifts.

MISCELLANEOUS

1—No. 6, Type K, Allis-Chalmers, Gates gyratory crusher, weight 25,500 lbs.
2—10x20 Blake type crushers.
2—9x15 Blake type crushers.
1—7x10 Blake type crushers.
1—6x5 Joshua Hendy ball mill.
1—4x3 Union Iron Works ball mill.
1—5x22 Tube mill.
2—New 14x27 manganese steel crushing roll tires.
2—New 16x43 Latrobe steel crushing roll tires.
1—60-ton Marion steam shovel.
1—10x16 Saddle tank Davenport locomotive, 36-in. gauge.
2—9x14 Saddle tank Davenport locomotives, 36-in. gauge.
4—7x10 Saddle tank Davenport locomotives, 24-in. gauge.
6—Double deck mine cages, 4x4½-ft. shaft.
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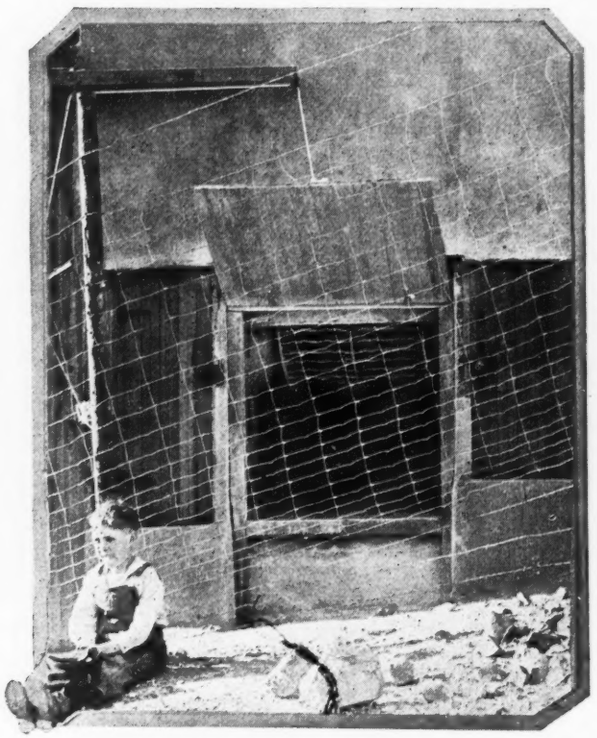

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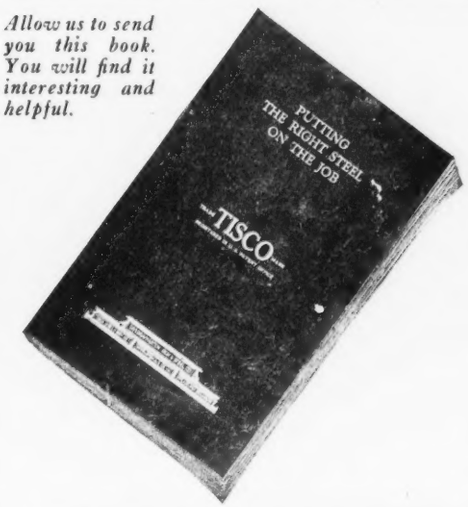

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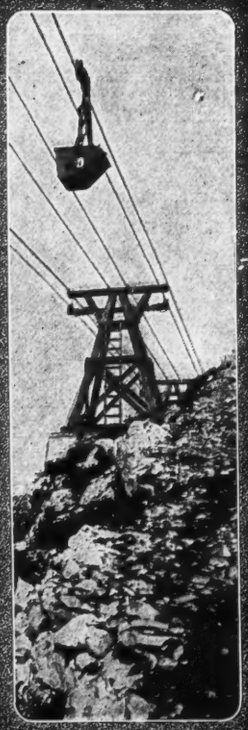

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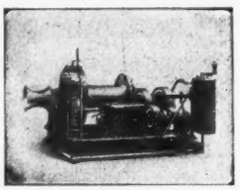

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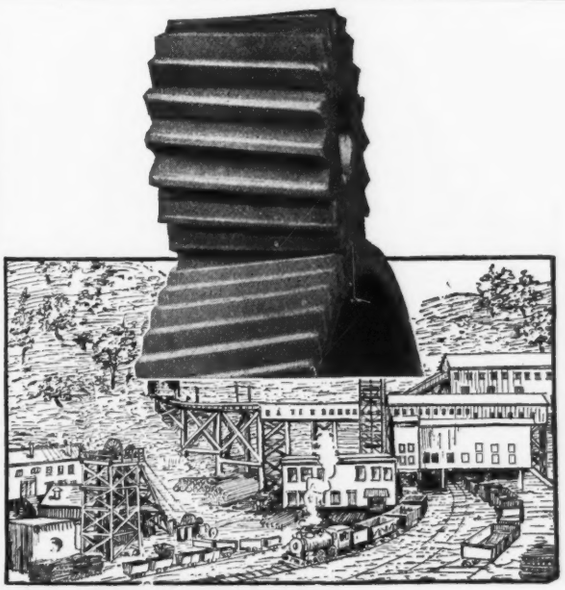

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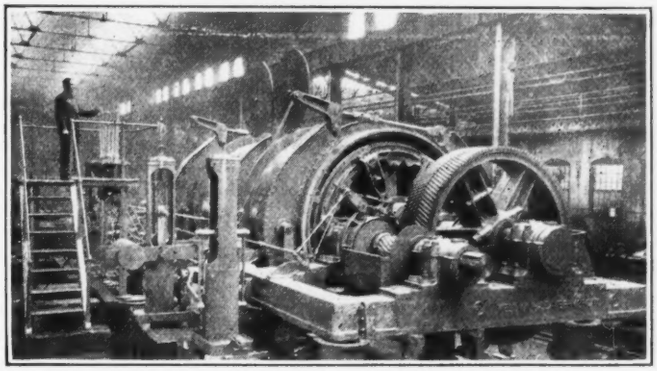

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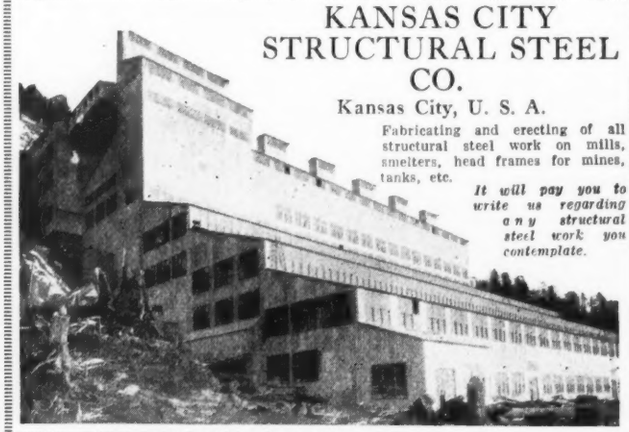

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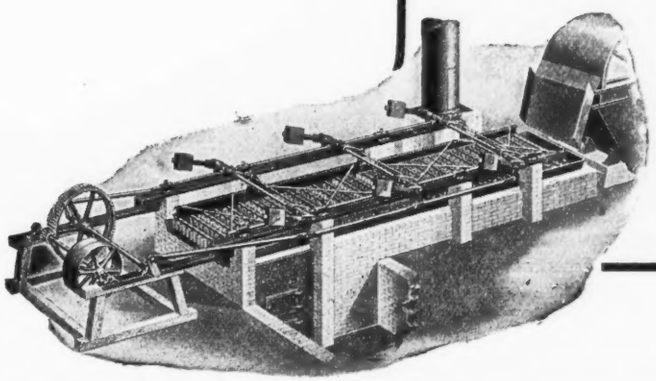

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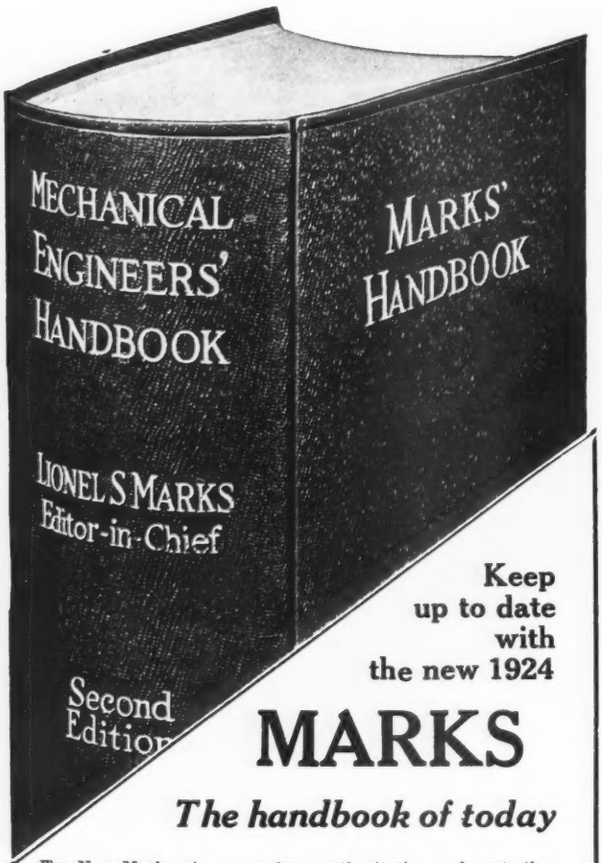

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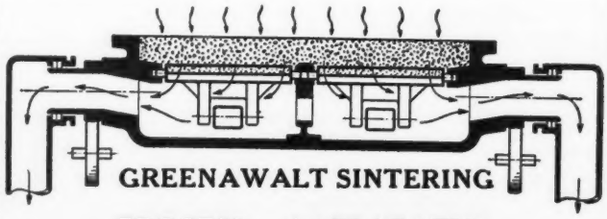

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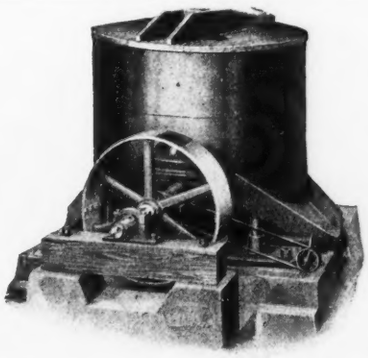

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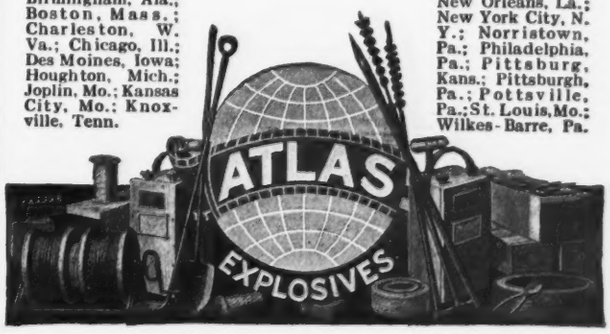

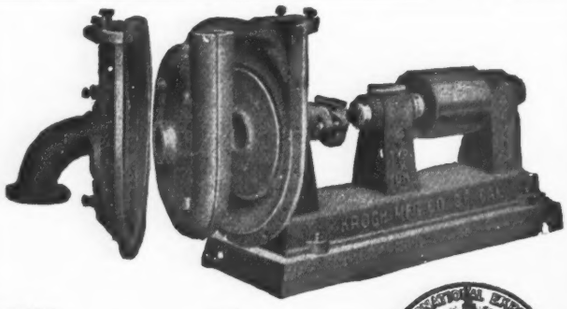

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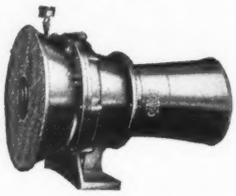

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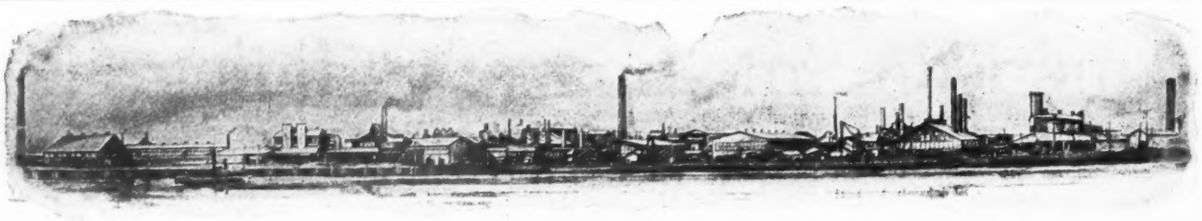

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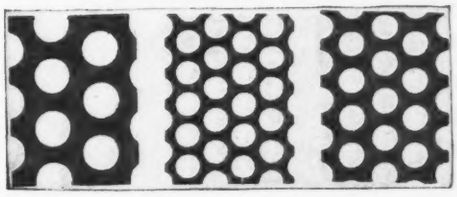

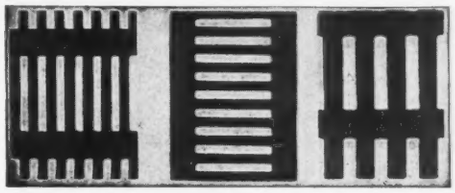

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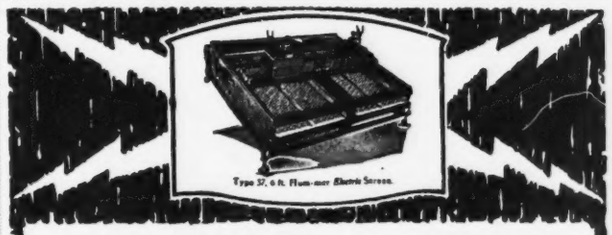

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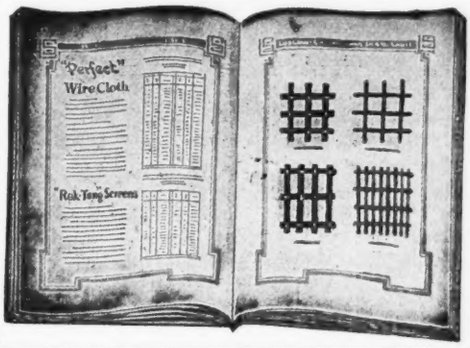

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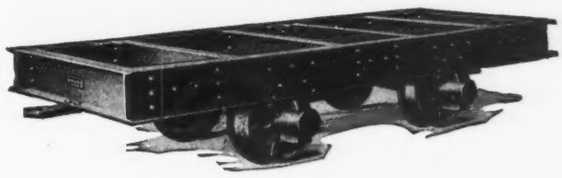

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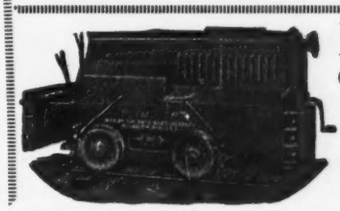

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PACIFIC COAST HEADQUARTERS FOR MINE SAFETY EQUIPMENT

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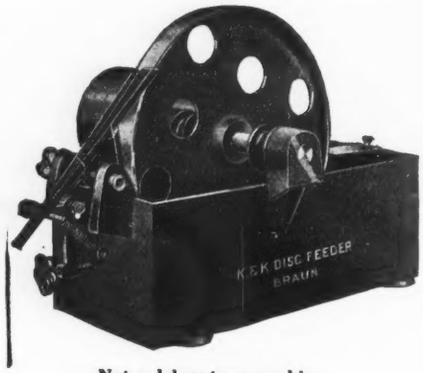

Not a laboratory machine

A Positive and Dependable

Oil Feeder in Flotation Work

is an essential factor in all modern flotation plants

The Braun K & K Mechanical Disc Feeder

absolutely eliminates detrimental results due to irregularity in feeding reagents. The fine adjustment is thick and accurate.

Two types of machines are offered—the Oil Feeder made of iron and the Acid Feeder made of lead and bronze to withstand the action of the reagents.

Oil Feeder $50.00 **Acid Feeder $80.00**

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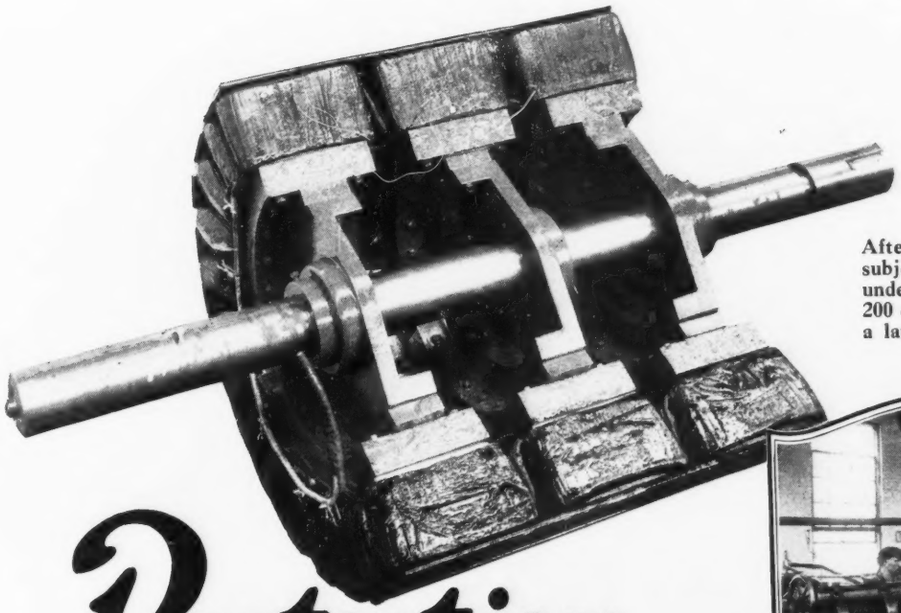
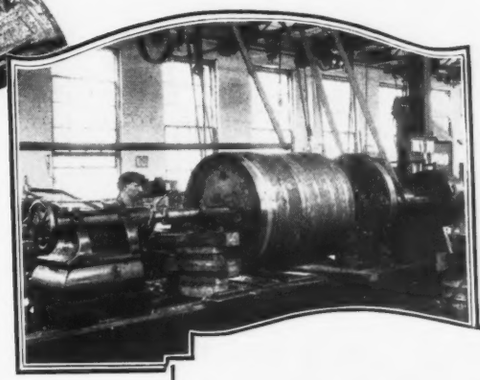


After a Dings Pulley is subjected to impregnation under a high vacuum and 200 degrees F. it is put on a lathe and crowned.



Protection— for years

IT'S the sturdiness in structure insuring years of service—a little more metal here, a bit more bracing there—that distinguishes Dings Magnetic Separators.

It's easy to boast of strength—let us show it:

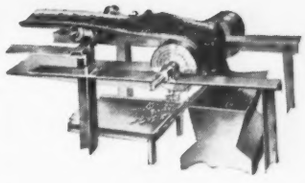
Every step taken in the manufacture of a Dings "High Intensity" Magnetic Separator is toward long service, protection for years. Note the cross section shown above — sturdiness in every part.

Not only does a Dings bring that greater range of magnetic flux that enables it to reach out and turn aside destructive iron, but it brings a built-in strength that enables it to give years of such service.

The facts are proven by over 4,000 Dings Separators ageing from 20 years to a few days—all proving themselves profitable.

Dings Magnetic Separator Co., 673 Smith St., Milwaukee, Wisconsin

Dings *High Intensity* MAGNETIC SEPARATION



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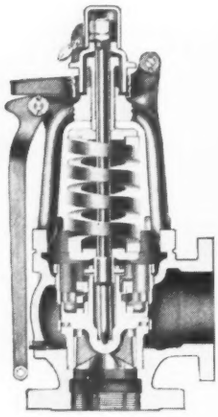
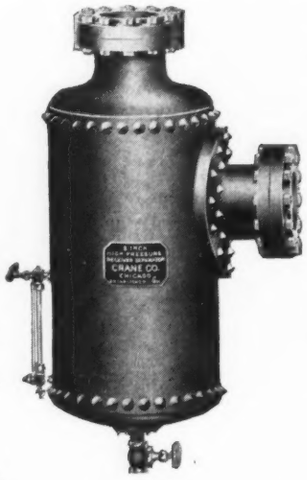
Bandera 261

EM&J 6-28 S-RTG.

CRANE STEAM SPECIALTIES PROMOTE SAFETY

No. 1117 outside spring pop safety valve meets the requirements of the A.S.M.E. boiler code. It has extremely large discharging capacity and permits close regulation for the blow-down.

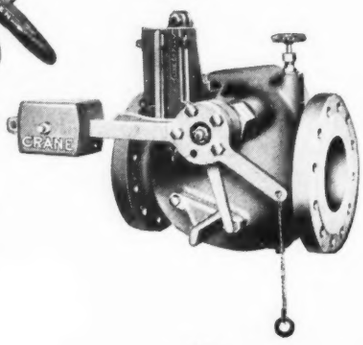




No. 020 receiver type steam separator has a shell built to meet all state and insurance requirements. Its large volume steadies the flow and enables it to take care of slugs of water when necessary.

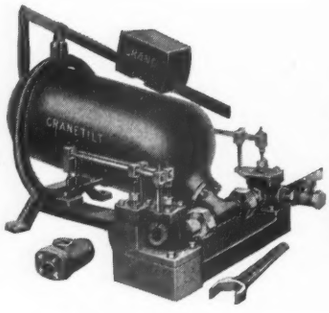
To give correct efficiency, separators must be automatically drained. For this purpose, Cranetilt steam traps are recommended.

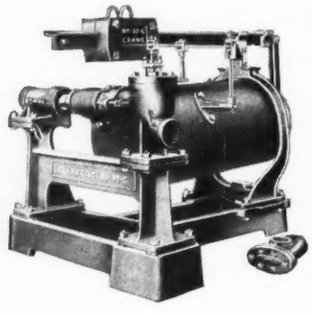
No. 28-E stop-check valve is accessible for internal examination without removing it from the pipe-line. It is noiseless under all load conditions. It will not pound, spin, stick or wear.



No. 46½-E emergency stop valve is essential in power plant equipment, not only on engine leads, but on lines throughout the plant as well. Its design is that of a swing check valve with flow against the disc. Its releasing device can be controlled electrically or by hand.

No. 100 three-valve lifting trap can also be used as a metering or a vacuum trap. It gives excellent service on return lines handling condensation under pressure varying from a vacuum to the highest pressures.





No. 33 non-return Cranetilt trap will automatically dispose of condensation collected from steam at any pressure. It has a malleable tank and balanced-type valves of Crane hard metal. Its "visible operation" and its large discharging capacity make it the most efficient and economical of all steam traps.

These steam specialties are the result of careful study, research and experiment by the Crane engineering department. They are designed to give you maximum service.

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